FACILITIES & SERVICES

Building Systems Manual

ACES Library, Info. & Alumni Center

Building No. 377
1101 S. Goodwin, Urbana, IL 61801
217-333-2416

(This manual is an attempt at providing one source for building information as it relates to the overall M/E Systems serving the building. If any format suggestions or any ideas of improvement, please send these to dmcfall@illinois.edu or call 217.244.6278)

Created by the Retrocommissioning Team, a division of Engineering at Facilities and Services

Updated or revised information will be provided to the Maintenance Division with F&S in the future.

ILLINOIS

Building Systems Manual Revision Log

This page is intended to be used to **record** revisions as they are made to this static manual. Such revisions are included in the digital "live" document at the time they are included in this manual.

Rev. No.	Revision	By Whom	Division / Dept.
0	Building Systems Manual issued (8/15/08)	D. McFall	RCx Team / Engineering

Foreword

The Building System Manual is meant to **inform** facilities staff, route mechanics, current or potential service contractors, as well as facility occupants and users as to the basis for operating and maintaining the facility's systems to reduce energy consumption and provide a better work environment **now**.

It is intended to be useful in the day-to-day operations of this facility.

It also forms the essential basis of transferring important 'system knowledge' from one party to the next. The following information is encouraged to be included in this manual:

- General facility description with the locations of major equipment (new and old).
- A definition of current facility objectives, functional uses, special services including emergency response and desired level of control including any energy efficiency or load management priorities (design intent).
- Operating standards or procedures for major use and critical space/special needs areas including indoor environmental quality requirements and occupancy requirements and schedules. Include a basic understanding of what NOT to touch and who is recommended to touch it.
- A description of each major HVAC system, including designed capabilities, limitations, usage instructions, location, pictures as needed and acceptable performance for each major system, identifying key performance metrics / benchmarks and accountability / follow-up requirements.
- Sequence of operation (control) for each major HVAC system, including setpoints, schedules, energy efficiency features and seasonal changeover procedures. As well as the web graphics site to monitor energy performance and scheduling.
- Identification of overall energy performance trends for each system if known and recommended techniques to aid in verifying performance or troubleshooting problems.
- An itemized list of all equipment to be maintained including known maintenance requirements, procedures or best practices.
- A list of any necessary training requirements or issues.
- A list of pertinent contact references.
- A log of events including dates and relevant issues and contact information: audits or surveys (maintenance, energy, lighting); purchases, replacement of equipment or new installations; building modifications; maintenance or testing; staff or contract changes; and problems identified and corrected.
- A questionnaire that guides new supervisors in acquiring relevant information from the departing supervisor.
- A reference to important as-built drawings and their location(s).
- A copy of a recent HVAC load calculation and TAB reports.
- The current annual utilities usage report.
- Relevant information from any commissioning report and updates if completed; the problem log and correction plan, pertinent checks and tests, a list of improvements made and sensor calibration data.
- Reference to location of Equipment Manuals, Shop Drawings, and O&M Manuals.

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Building Narrative 01

This section is dedicated to the ever evolving history of the building in general, including remodels, additions, building uses, etc... It is here to introduce a stranger and a friend to the building under care.

Building Narrative

The Isaac Funk Family Library (Funk Library or Funk ACES Library, for short) is in an octagonal-shaped brick building, located southeast of the old ACES Library, which was in Mumford Hall. It occupies the 2-5th floor of the ACES Library, Information, and Alumni Center (LIAC).

ACES (Agriculture, Consumer and Environmental Sciences) Library, Info. & Alumni Center is a relatively new building opening in 2002. The overall size of the building is approximately 82,000 square feet. The ACES College is responsible for the lower two levels of this building while the Funk Library occupies the upper three levels.

This Library was dedicated to Isaac and Cassandra Funk, important early settlers of the McLean County. Isaac Funk used to drive his livestock over land to markets in Galena and Chicago, Illinois. He bought and sold livestock and land, and when he died in 1865, he was a millionaire, as well as an Illinois State Senator.

The ACES Library houses some of the collections that include agricultural economics, agricultural engineering, animal genetics, floriculture, forestry, and many others. The newest computers were made available, as well as internet hookups at every table and desk. The new building's large study rooms are very popular with students seeking a place to meet with groups and study partners. The instructional lab on the fifth floor provides a valuable service to the campus. Also, temperature and humidity are under fine tuned control, and the collection will last much longer in the new facility.

The following is a current timeline of the building and its systems:

- *1924*: ACES Library moved to Mumford Hall
- *1995*: ACES Library acquires the Home Economics Collection forcing it to divide its materials in two different buildings (Mumford Hall and Bevier Hall)
- *2001*: Current building and systems originally designed and constructed.
- *Aug., 2001*: Occupied by the Library.
- *June, 2008*: The building was visited by the Retrocommissioning Team, Division of Engineering with Facilities and Services of the University of Illinois.

(Information cited above is credited to: http://www.library.uiuc.edu/agx/virtual_tour/about/index.htm and other internet sites at the University of Illinois website featuring ACES Library)

PLUMBING SYSTEMS

No investigation has been made of the plumbing systems as of the time of this narrative.

HVAC SYSTEMS

The building is connected to the central campus chilled water loop and has a functioning chilled water meter presently in the basement mechanical room, even though this needs to be replaced with more accurate equipment and relocated to a more suitable site for maintenance and troubleshooting (located behind a steam main high in the air). The steam meter resides in the basement mechanical room. There are two (2) significant air handling units in the building: one VAV unit located in the penthouse (63,000 CFM approx.) and one VAV unit located in the basement (25,000 CFM approx.). There are two (2) toilet exhaust air fans with a combined flow rate of approximately 14,000 CFM.

There are two (2) steam-to-heating-water heat exchangers in the original building for the perimeter radiation system and the reheat system. The heating water supply temperature is reset based upon the outdoor air temperature.

There is a good level of electronic, automatic controls in the building. The air handling units and heating water systems have Direct Digital Controls (DDC) while the VAV boxes and finned tube radiation are pneumatically controlled. The pneumatic controllers are of an older vintage which should be replaced in the future.

ELECTRICAL SYSTEMS

The electrical systems in the building appear to be original equipment but have not been reviewed thoroughly. There is a lighting control system installed to control daylight and regulate light fixture output to save energy. This system was currently abandoned and the method to program had been lost. Engineering has contacted the company, received an installation manual and is awaiting a programmer or self-motivated route technician to investigate. The lighting controls manuals are included in this document under “Electrical”.

OTHER SYSTEMS

No other systems were noted or investigated at the time of this writing.

SITE PLOT PLAN

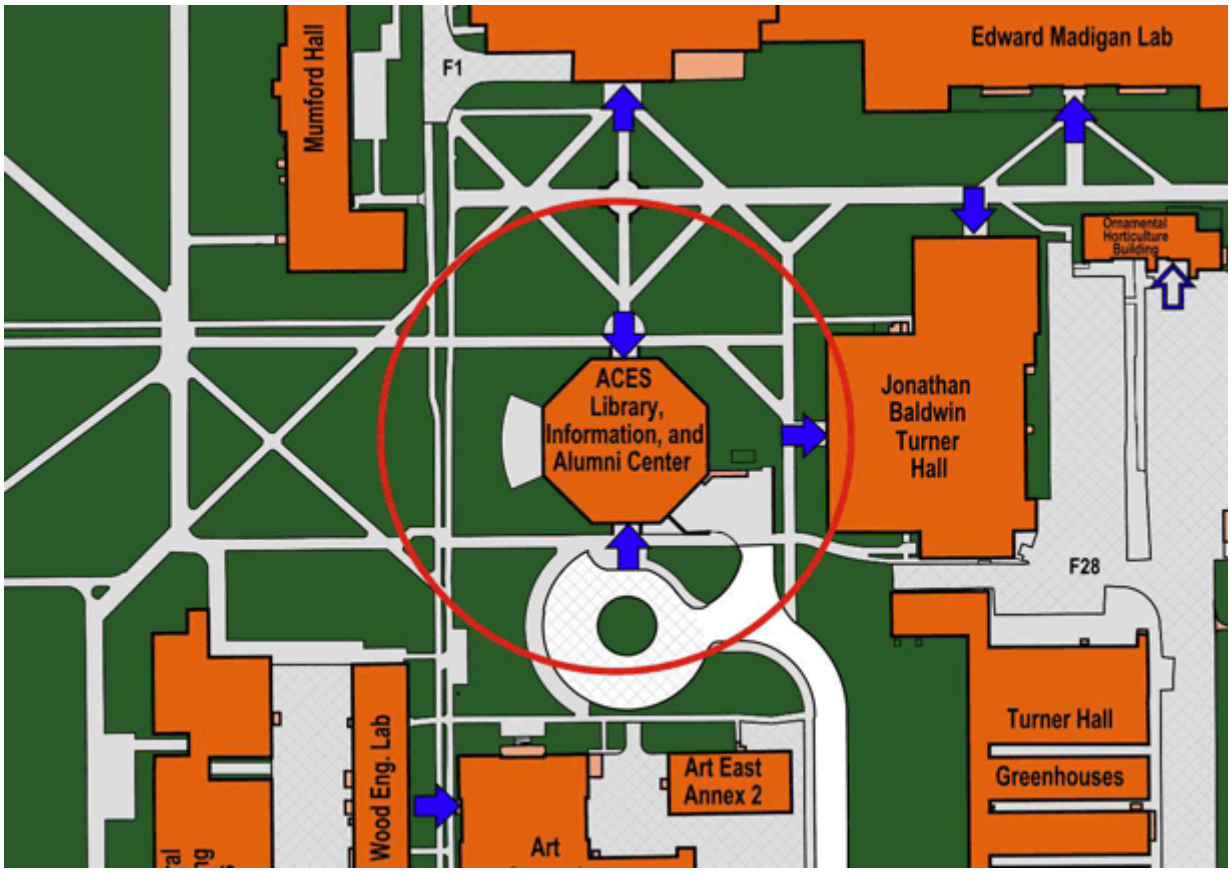


Figure 1: Site Plot Plan

OCCUPANCY REQUIREMENTS & SCHEDULING

This building is used by students on a regular basis and by others on campus for the meeting spaces in the Lower Level and the 5th Floor. There are hours of operation for the facility and the HVAC controls have been programmed to run according to those schedules. Any changes desired should be referred to Facilities and Services DDC Programmers.

EMERGENCY RESPONSE

This facility is not an emergency command center and is not currently used as a staging area. In case of an emergency refer to: http://www.dps.uiuc.edu/erg.pdf to locate telephone numbers and methods to safely encounter many emergency situations.

INDOOR ENVIRONMENTAL QUALITY REQUIREMENTS

This facility requires optimum humidity and temperature control in each of the spaces where collections are stored. The desired occupied temperature should be kept between 68 deg F and 74deg F depending on the season. A setpoint of 72 deg F is preferred to meet the thermal comfort for the majority of the visitors and employees. The desired relative humidity is 50% with a tolerance level of +/- 10%. The use of outdoor air is encouraged for adequate ventilation and "free" cooling, as long as the relative humidity levels are not compromised.

UTILITY COST / ENERGY SAVING GOALS

The primary energy saving goals for this site are to limit energy use where possible, taking full advantage of economizer function by maximizing the use of outdoor air for cooling and to limit air conditioning and lighting functions during unoccupied hours, except where needed.

DOCUMENTATION AND TRAINING NEEDS

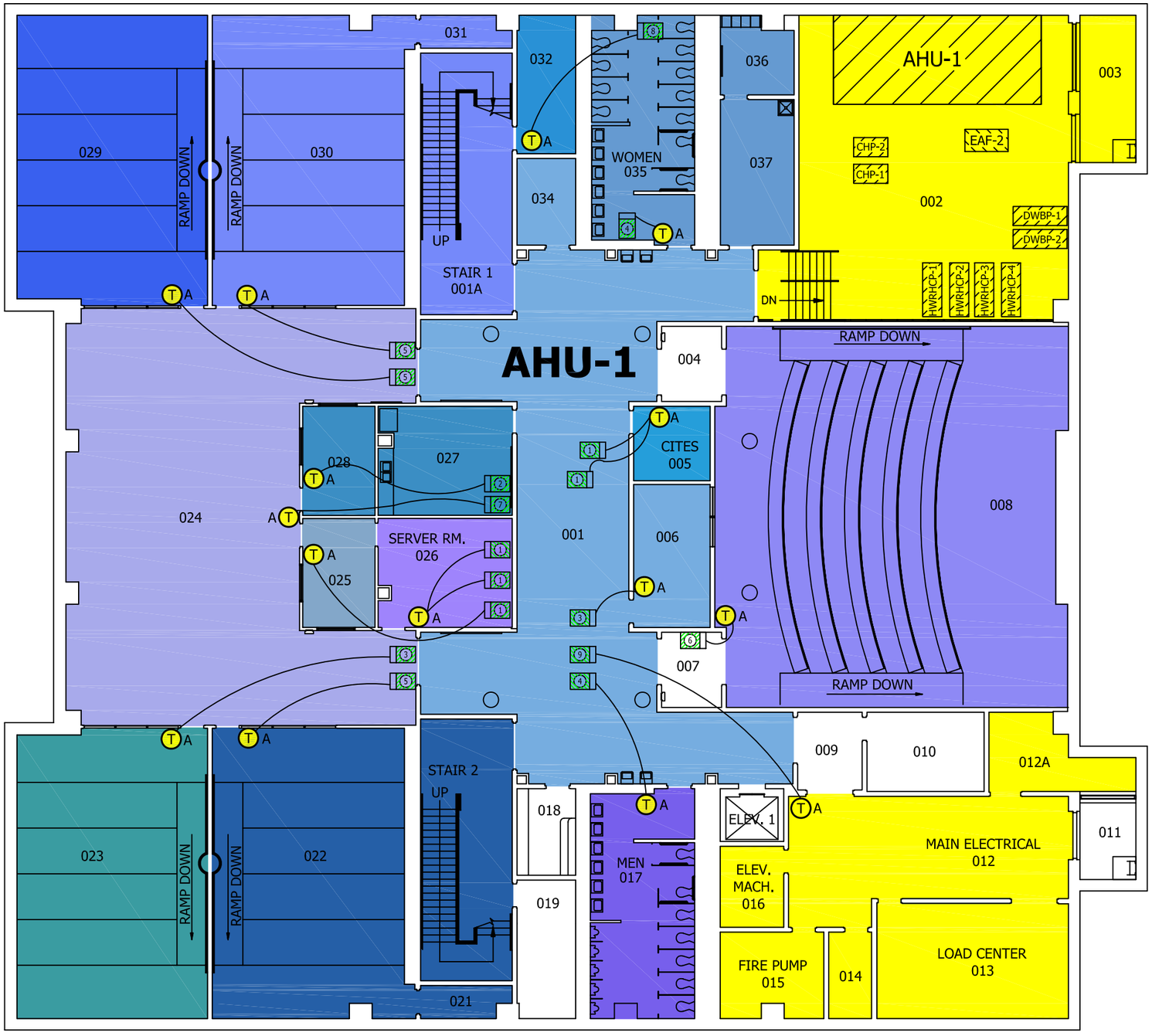
The building operations director, assistants, building mechanics, and any route mechanics who will adjust, troubleshoot, or work on the air handling units or their associated parts, MUST be trained in accessing the DDC control system information. They MUST be able to understand setpoints, schedules, and diagnosing minor system upsets using trend reports. This system manual must be provided to staff for the successful daily operations and maintenance of the facility to preserve the facility in its best condition.

PERFORMANCE ACCEPTANCE CRITERIA

The primary criterion used to define acceptable performance for this facility is the requirement to limit occupant complaints while maintaining reasonable utility bills. The systems should rarely be forced out of service. Occupied space should be kept inside the 68F – 75F zone year round and "hot" and "cold" calls minimize. To provide this performance, the HVAC control system must function properly and be viewable through graphical information. The operators must be able to adjust setpoint temperatures, humidity levels and building pressure.

Building Floor Plans 02

This section is dedicated to floor plans identifying locations throughout the building. This can be useful for noting equipment, control panel locations, elevator numbering, fire extinguishers or other such essential items that require knowledge of the layout of the building.



NORTH

BASEMENT PLAN

0 8 16 24 32 FEET

Pneumatic Thermostat

- (T) A - Controls Air System
- (T) R - Controls Radiant System
- (T) A/R - Controls Air & Radiant System
- Variable Air Volume Box

facilities & SERVICES

Retro Commissioning(RCx) | Engineering Services

RETRO-COMMISSIONING

ACES LIBRARY AND ALUMNI CENTER

BUILDING NO. 377

PRELIMINARY

#	Date	Revision Description
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Proj. No. 4427189-162 | Date: 06-03-08

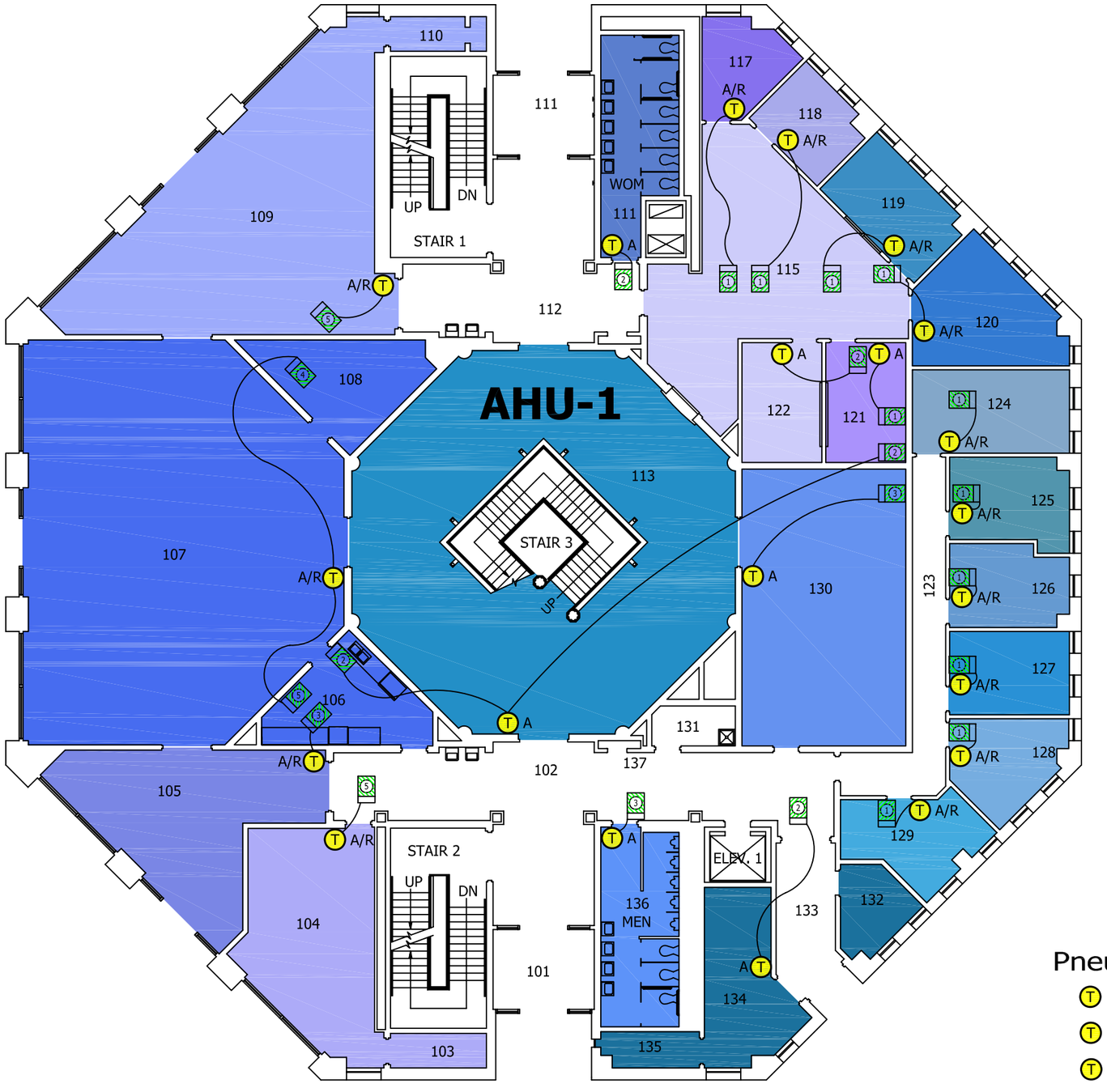
Reviewed: DEM | Drawn: JTM

LOWER LEVEL MECHANICAL PLAN

M-100

1 of 6 sheets

11x17



FIRST FLOOR PLAN

Pneumatic Thermostat

- A - Controls Air System
- R - Controls Radiant System
- A/R - Controls Air & Radiant System
- Variable Air Volume Box

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-	-	-

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4427189-162	06-03-08
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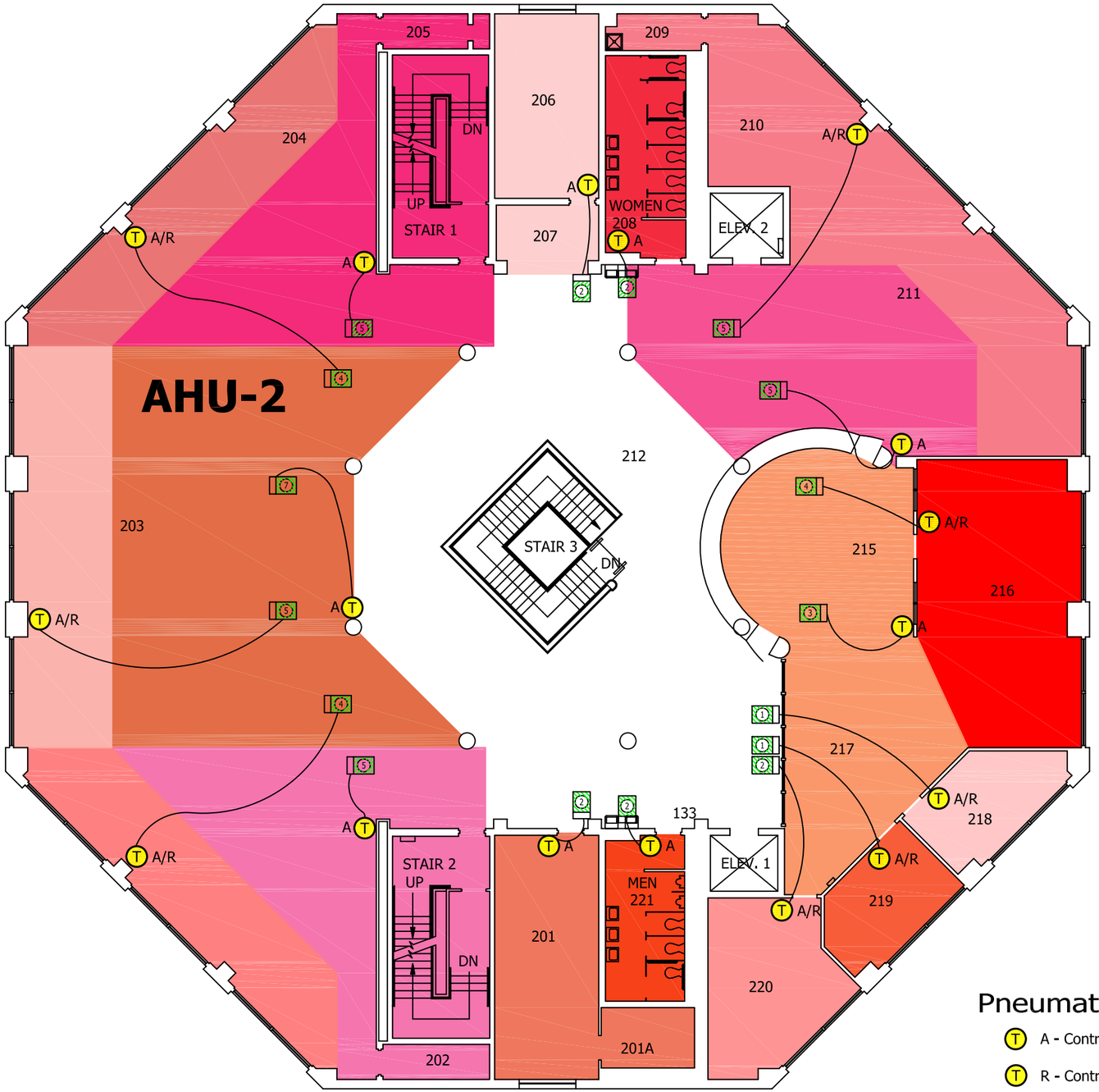
FIRST LEVEL MECHANICAL PLAN

M-101

2 of 6 sheets



Pneumatic Thermostat

- A - Controls Air System
- R - Controls Radiant System
- A/R - Controls Air & Radiant System
- Variable Air Volume Box

NORTH

SECOND FLOOR PLAN

0 8 16 24 32 FEET

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ACES LIBRARY AND ALUMNI CENTER
BUILDING NO. 377

PRELIMINARY

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-	-	-
-	-	-
-	-	-
-	-	-

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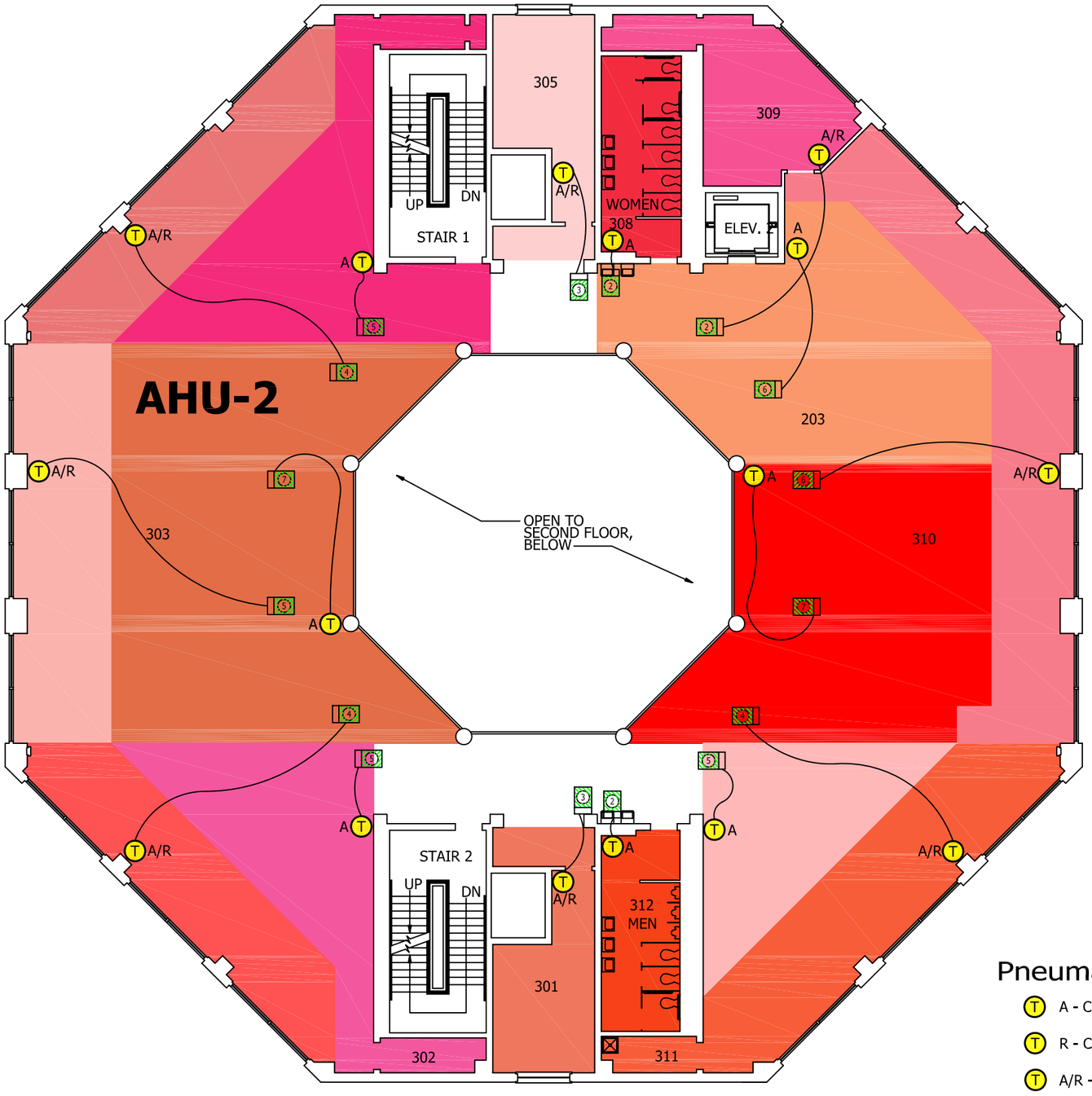
SECOND LEVEL MECHANICAL PLAN

M-102

3 of 6 sheets



Pneumatic Thermostat

- A - Controls Air System
- R - Controls Radiant System
- A/R - Controls Air & Radiant System
- Variable Air Volume Box

NORTH

THIRD FLOOR PLAN

0 8 16 24 32 FEET

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ACES LIBRARY AND ALUMNI CENTER
BUILDING NO. 377

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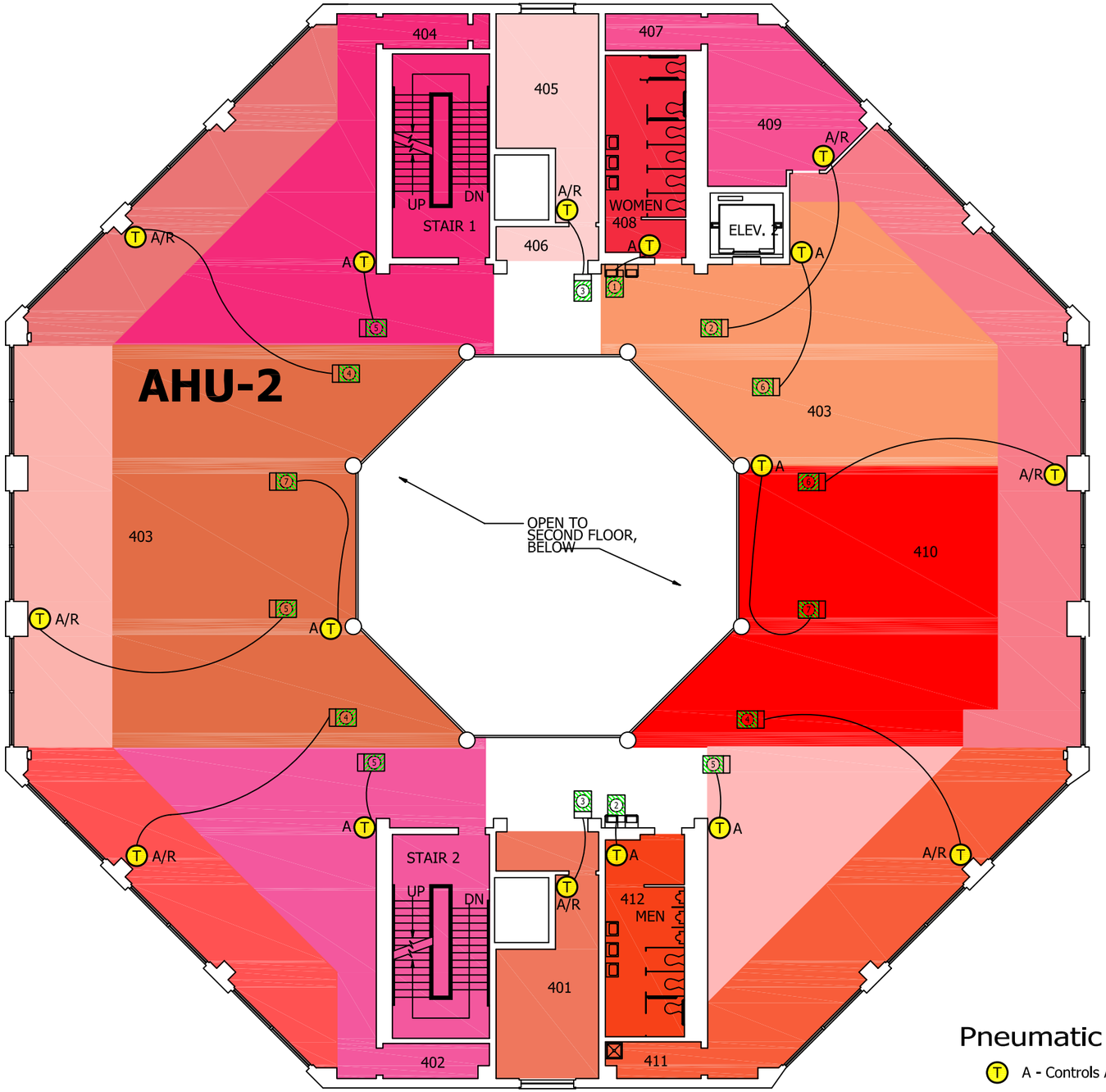
THIRD LEVEL MECHANICAL PLAN

M-103

4 of 6 sheets



NORTH

FOURTH FLOOR PLAN

0 8 16 24 32 FEET

Pneumatic Thermostat

- A - Controls Air System
- R - Controls Radiant System
- A/R - Controls Air & Radiant System
- Variable Air Volume Box

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RETRO-COMMISSIONING

ACES LIBRARY AND ALUMNI CENTER
BUILDING NO. 377

PRELIMINARY

#	Date	Revision Description
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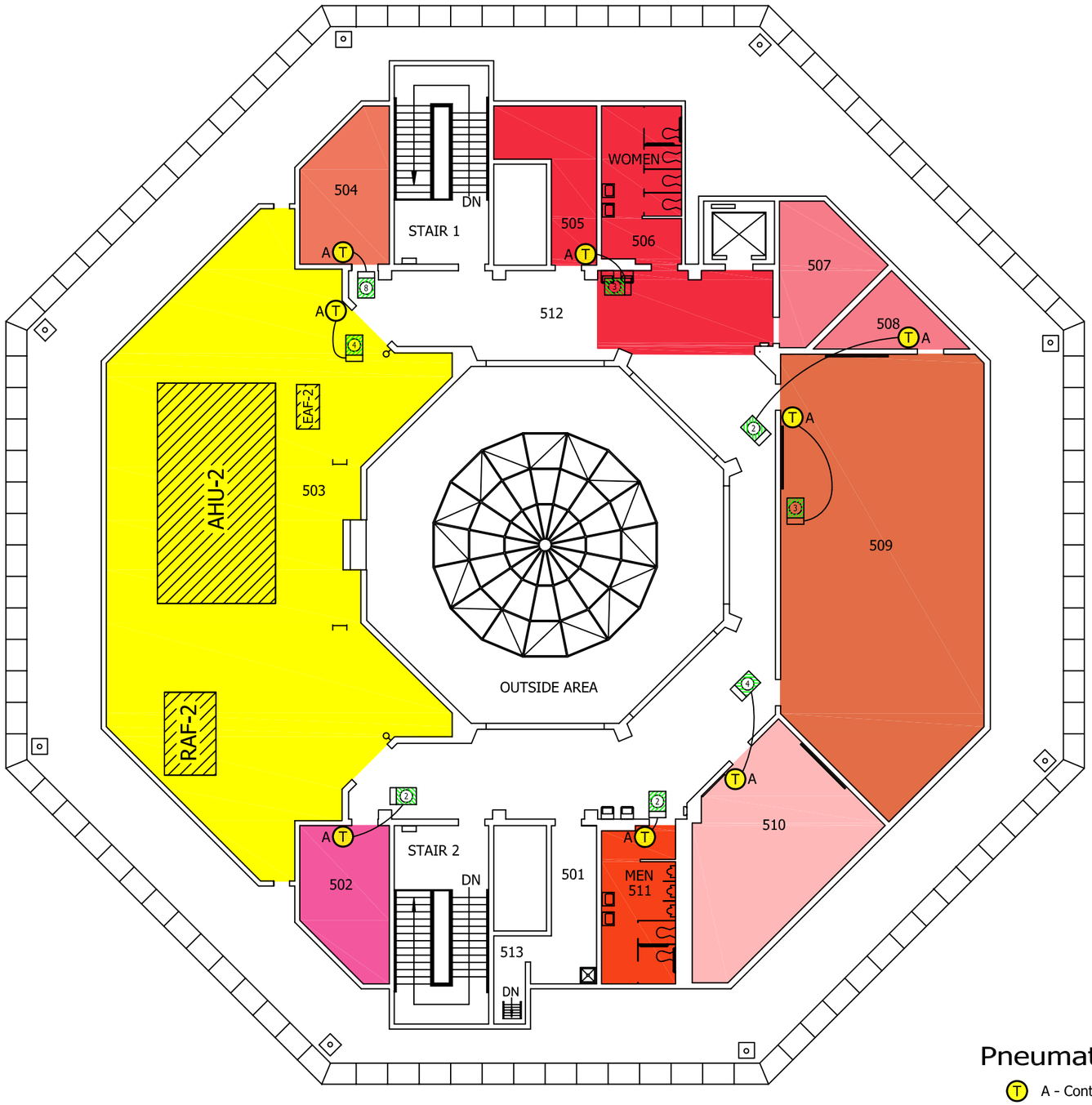
Reviewed: DEM	Drawn: JTM

FOURTH LEVEL MECHANICAL PLAN

M-104

5 of 6 sheets



NORTH

FIFTH FLOOR PLAN

0 8 16 24 32 FEET

Pneumatic Thermostat

- A - Controls Air System
- R - Controls Radiant System
- A/R - Controls Air & Radiant System
- Variable Air Volume Box

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RETRO-COMMISSIONING

ACES LIBRARY AND ALUMNI CENTER
BUILDING NO. 377

PRELIMINARY

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Proj. No.	Date:
4427189-162	06-03-08
Reviewed: DEM	Drawn: JTM

FIFTH LEVEL MECHANICAL PLAN

M-105

6 of 6 sheets

11x17

Owner's Operating Requirements 03

This section is dedicated to the Building Facility Manager. It allows space for noting experiences, occupancy schedules, and specific conditions that the Owner wishes to achieve in the building.

Equipment Inventory and Description

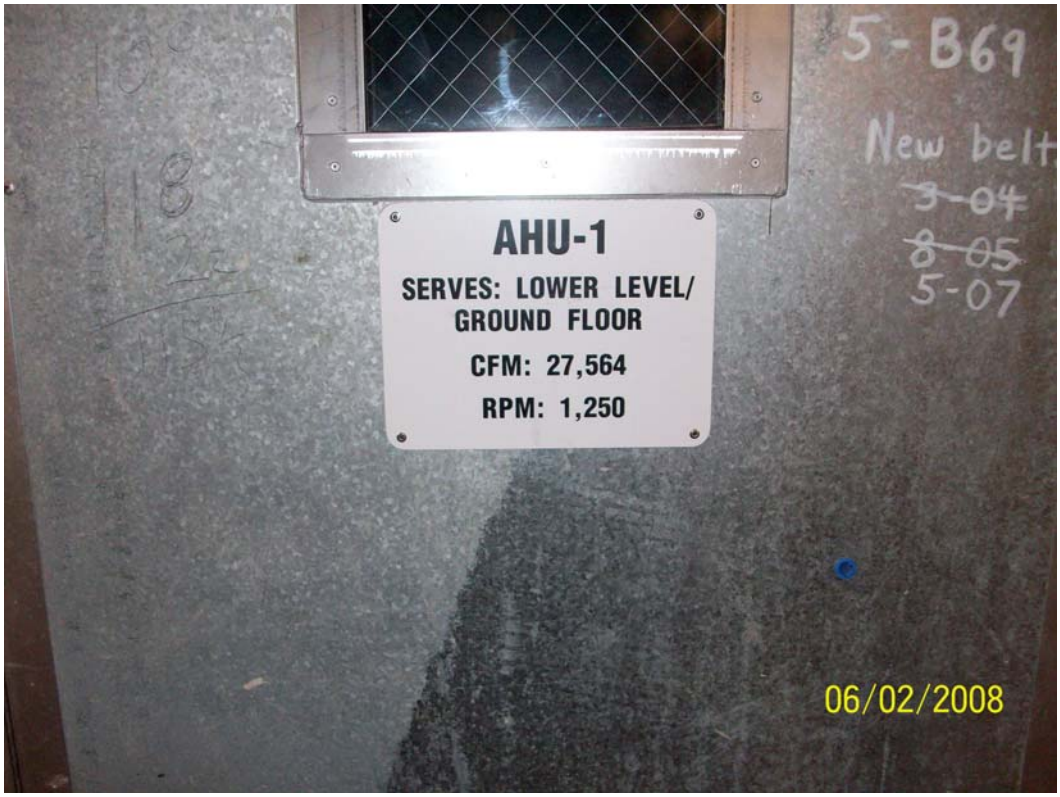
ACES Library, Info. & Alumni Center

AIR HANDLING UNIT AHU-1 w/ RF-1

This air handling unit has an external relief/return fan. It is a custom built Buffalo air handling unit with the following in order: outdoor / return air intake plenum, air blender, 30% pleated pre-filters, 95% bag filters, split steam heating coils, humidifier dispersion tubes, offset chilled water cooling coils, double inlet centrifugal supply fan.

Fan controls are direct digital with pneumatic actuation. The Retrocommissioning Team calibrated all the DDC transducers, DDC transmitters and the pneumatic pilot positioners for the damper and valve actuators. There were repairs made to the return and relief damper linkages for AHU-1 to obtain better control of these dampers.

These fans were supposed to be controlled by using the CFM flow monitors that are installed in the supply duct and the return duct. However, the supply CFM monitor is installed to close to the discharge of the supply fan and is unreliable. So now the supply fan is maintaining a static pressure in the duct via a control loop in the LCM Controller that is putting a 0-100% output to the VFD. The return fan is running 10% behind the supply fan at all times via a math block in the LCM that is taking the supply fan loop 0-100% and subtracting 10% from that value and putting the new value in an AO block going to the return fan VFD. So if the supply fan is running 70% the return fan would be running at 60%. This fan is supposed to maintain a static pressure of 1 in. w.c. The system also uses enthalpy control for modulation of the mixed air dampers and the economizer cycle.


5-B69
New belt
3-04
8-05
5-07
AHU-1
SERVES: LOWER LEVEL/
GROUND FLOOR
CFM: 27,564
RPM: 1,250
06/02/2008

COOK
RF-1
SERVES: LOWER LEVEL/
GROUND FLOOR
CFM: 22,250@60HZ/
18,625@50HZ
RPM: 962@60HZ/
808@50HZ
Belt
2-B 108
New belt
3-04
8-05
5-07
06/02/2008

Humidifier

AIR HANDLING UNIT AHU-2 w/ RF-2

This air handling unit has an external relief/return fan. It is a custom built Buffalo air handling unit with the following in order: outdoor / return air intake plenum, air blender, 30% pleated pre-filters, 95% bag filters, split steam heating coils, humidifier dispersion tubes, offset chilled water cooling coils, double inlet centrifugal supply fan.

Fan controls are direct digital with pneumatic actuation. The Retrocommissioning Team calibrated all the DDC transducers, DDC transmitters and the pneumatic pilot positioners for the damper and valve actuators. There were repairs made to the return and relief damper linkages for AHU-1 to obtain better control of these dampers.

These two fans run via VFD's that are of the ABB 600 type. The fans are totally controlled by the BAS, which is all of the Barber Coleman Network 8000 type. The DDC controllers are composed of LCM's and GCS's. There really isn't any room for expansion on theses controllers. The supply fan is controlling building static and the return fan is controlling building pressure. The return and humidity sensors are the Vaisala Type. The system also uses enthalpy control for modulation of the mixed air dampers and the economizer cycle.

06/02/2008

00377-RF2
WARNING
RF-2
SERVES: 2-3-4-5
CFM: 57,669
RPM: 831
06/02/2008

EXHAUST AIR FANS EAF-1 & EAF-2

These fans are controlled by the building DDC. They serve the bathroom exhaust. Both of the current sensors are set up to indicate belt loss. The DI point is coming directly from the current sensor to the DI point on the GCS controller. Gold contact relays are not installed at this time. If they were installed it would be a more reliable indication of fan status. A DO point issues a start/stop command to both fans. These fans now run based upon an occupancy schedule.

STEAM CONDENSATE METER & PUMPS

A new meter has been installed within the last year. The condensate pumps are started and stopped by DDC. The data is also sent via the DDC system for billing.

CHILLED WATER METER

Before the central campus chilled water loop, this building was fed from the Library Loop with building pumps. These pumps still exist and are wired to run, even though not necessary. The bypass valve has been opened and the pumps shut off. The meter itself is an Anubar type flow meter. It is not the type that are typically used on the chilled water entrances, and it is located on the chilled water return pipe and is hiding behind a large steam pressure regulator valve on the steam entrance line. There is discussion of replacing the meter and relocating it to the supply side on top of AHU-1 and be of the ABB type.

PERIMETER RADIATION CONVERTOR & PUMPS (P-1, P-2)

Convertor controls are direct digital with pneumatic actuation. There are two pumps for this convertor that are run via VFD's of the ABB type. The pumps are controlled by the DDC system. DDC will start/stop, get a status DI, and send an AO for speed reference, control run times and do redundancy control. The pumps speed will vary according to the differential pressure in the system. There is a pressure transmitter on the fifth floor that is looking at the differential pressure. DDC is also controlling the steam valve on the convertor and maintaining temperature set point. The set point for this system is 10 PSID. There have been problems with low system volume and make-up water valve closure requiring the pump to run 100% when not necessary. This needs to be avoided and any problem carefully reviewed to correctly fix the system.

REHEAT COIL CONVERTOR & PUMPS (P-3, P-4)

Convertor controls are direct digital with pneumatic actuation. There are two pumps for this convertor that are run via VFD's of the ABB type. The pumps are controlled by the DDC system. DDC will start/stop, get a status DI, and send an AO for speed reference, control run times and do redundancy control. The pumps speed will vary according to the differential pressure in the system. There is a pressure transmitter on the fifth floor that is looking at the differential pressure. DDC is also controlling the steam valve on the convertor and maintaining temperature set point. The system is supposed to maintain a pressure differential of 20 PSID set point. There have been problems with low system volume and make-up water valve closure requiring the pump to run 100% when not necessary. This needs to be avoided and any problem carefully reviewed to correctly fix the system.

DOMESTIC WATER BOOSTER PUMPS

This packaged skid controls don't work and haven't worked for quite some time. Therefore, the unit doesn't work automatically. This setup has been abandoned in place, with the backflow preventer removed.

Commissioning Final Reports 04

This section is dedicated to the Commissioning Projects that have taken place during the life of this building. It holds the findings, recommendations and links to improving even further the quality of life for the residents and the maintenance for the building systems.

Retrocommissioning Final Report

ACES LIBRARY, INFO. & ALUMNI CENTER

AUGUST, 2008

A work completed by

Retrocommissioning Team
Division of Engineering Services
Facilities & Services

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Retrocommissioning Final Report

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Executive Summary

The Retrocommissioning Team in conjunction with Facilities and Services Engineering Division completed a retrocommissioning study of ACES Library, Info. & Alumni Center, for the University of Illinois. ACES was considered to be No. 52 in the Top 100 List of Energy Consumers on campus, with an estimated $355,000 annual utility cost. The project was funded by student fees in harmony with their vision to create a sustainable campus.

Retrocommissioning, or returning a building to its originally intended design while integrating energy saving measures, is a snapshot in the life of a building that applies a systematic investigation process to improve and optimize a building's operation and to offer suggestions to improve the overall maintenance. It is an independent process that focuses on the building's energy using equipment such as the HVAC and other mechanical equipment, lighting equipment, and related controls. It may or may not emphasize bringing the building back to its original intended design specifications. In fact, via the process, the retrocommissioning team may find that the original specifications no longer apply. The process may result in recommendations for capital improvements, but its primary focus is to optimize the building systems via performing long-needed maintenance and care for aged systems, improving control strategies and allowing graphic displays, tailoring the building's energy needs by its current tenants, and by improving the very nature of operations and maintenance. Details of this structured method are provided later in the report.

The retrocommissioning process began in May of 2008. It involved a coordinated effort between the RCx Team, Director of Engineering, and the willing building staff at ACES. The process included reviewing documents, conducting interviews with staff and inhabitants of the spaces, performing field investigations, monitoring and analyzing building systems, developing a master findings list, and assisting ACES with selecting measures for implementation. Some of these findings were a mix of "operation and maintenance" repairs that had estimated paybacks of two years or less and "energy saving projects" that were more costly to implement and therefore longer paybacks. Additional improvement measures are also sprinkled in that had potential energy saving and equipment maintenance impacts, but the saving estimates were based more on experience rather than energy modeling or engineering estimates.

Overall, the Retrocommissioning Team has reduced the energy consumption **13%** at ACES. This is an estimated annual savings of **$75,000**. Such results are rewarding and will continue to accrue monetarily each month. This report shows the results of these persistent efforts.

Purpose

The University of Illinois has educated thousands of students over a period of a century. Many of the existing buildings on campus were designed and constructed during an era of abundance, when energy was abundant and economical. Buildings were designed around a certain space intent, which over the years has dramatically changed with new departments and space shifting. Operations and maintenance funding has not grown in proportion with the expansion of the real estate of the university. Maintenance folks have been stretched thin, assigned to care for 10 to 15 or more buildings at one time. Therefore, existing heating, ventilating and air conditioning equipment and associated equipment has been neglected.

These factors have compounded to reduce the efficiencies and operation strategies of the hundreds of pieces of equipment throughout campus, requiring increased expenditures on energy utility costs and decreased tenant comfort. The future is showing an ever increasing utility market, and therefore the essential need for improving the way energy is used. For this very reason, the Retrocommissioning Project was funded to assist the University to lower energy consumption, educate building tenants, and give direction in using energy in a sustainable way.

Methodology

What is retrocommissioning? It is a process whereby a team of engineers and technical individuals approach an existing building with the goal of saving energy and improving tenant comfort. The process requires a review of the operations and maintenance currently conducted in the facility. During field investigations the team meets weekly and brainstorms on methods to improve the building's performance and efficiency. The basic process requires five fundamental procedures:

- Investigation and data collection
- Analysis of data
- Implementation of solutions
- Larger Projects Delegated
- Verification of savings

These steps all occur concurrently. However, the report below shows in detail how the investigation and data collection takes place. The remaining procedures are placed in a table together to logically show the process at each point in time. The last part will discuss the verification of savings that resulted from the decisions made by the Retrocommissioning Team.

Investigation and Data Collection

The retrocommissioning process began by collecting and evaluating data pertaining to facility equipment and current operation. The primary tasks for this project are outlined below.

Documentation Review

The first step of the investigative process consisted of obtaining as much building documentation as possible to allow the Team to become familiar with the building and its systems. Blueprints, control shop drawings, and energy data were gathered and reviewed by the RCx Team.

Site Assessment

The next step was to conduct the site assessment. First on the agenda was interviewing the directors and assistants of the operations and maintenance staff at ACES. Questions were asked to ascertain the facility's operating condition, where specific, known challenges were, what maintenance has been performed, and so forth. The retrocommissioning process was also explained and the rewards for assisting were discussed.

Many weeks were spent in the building investigating each HVAC piece of equipment and its role in using energy. Each of its components was reviewed including: ductwork, coils, control sequences, control valves, pneumatic hardware, and temperature and pressure sensors. Occupancy schedules were noted, space pressures were trended, and tenants were interviewed.

Discussions took place with the route mechanics to gain a more in-depth understanding of the building HVAC equipment conditions over the last couple of years. Amongst the panoply, it was noted that the air handling equipment had a difficult time maintaining building pressure, thereby preventing the outside doors from closing completely.

Analysis of Data

At each step along the way the findings were noted and discussed at the weekly progress meetings. Decisions were made at many of these meetings and the actions were followed through with the varying parties. Therefore, the list below is generated in the form of tables showing the 1) finding, 2) Proposed RCx Solution, 3) The implicated cost estimate and payback expected (if any), 4) If the implementation took place or not, and 5) Which party is/was responsible for actions.

The implementation of solutions was dependent upon the costs and responsibility factors associated with such deficiencies. In many cases the RCx Team went ahead and resolved the findings listed with direction from Facilities and Services Engineering Director. These immediate adjustments helped facilitate the energy savings that are observed currently. Some solutions are quick paybacks, others of longer duration, and yet others that are based on qualified engineering principles and experience.

Energy Saving Projects Proposed

Energy Savings Project Proposal #1					
Finding	There are two existing toilet exhaust fans (14,000+ CFM) which appear to run 24/7.				
Proposed Solution	DDC should be added to take control of the exhaust fans to turn them off during unoccupied hours and thereby save energy.				
Cost Estimate:	$2,000	**Payback:**	< 1 yr.	**Implemented?**	☒ Yes ☐ No ☐ Will Be
☐ Handed Off? ☐ To Maintenance ☐ To Engineering	☒ Completed by RCx			☐ Completed by Maintenance	
Additional Notes:					

Energy Savings Project Proposal #2					
Finding	Minimum settings on the VAV boxes is greater than required.				
Proposed Solution	Reduce the minimums at each box to allow slower supply fan and return fan speeds.				
Cost Estimate:	NA	**Payback:**	IMMED.	**Implemented?**	☒ Yes ☐ No ☐ Will Be
☐ Handed Off? ☐ To Maintenance ☐ To Engineering	☒ Completed by RCx			☐ Completed by Maintenance	
Additional Notes:					

Energy Savings Project Proposal #3					
Finding	Fan belts currently use multiple thin belts.				
Proposed Solution	Could install the Gates® motor sprockets and polychain belt to increase energy savings and reduce the amount of annual maintenance to the fan.				
Cost Estimate:	$1,500	**Payback:**	8 mo.	**Implemented?**	☒ Yes ☐ No ☐ Will Be
☒ Handed Off? ☒ To Maintenance ☐ To Engineering	☐ Completed by RCx			☒ Completed by Maintenance	
Additional Notes:					

Energy Savings Project Proposal #4					
Finding	Building outside air humidity sensor did not give accurate readings. The mixed air damper control is based on enthalpy control referencing the humidity sensor reading.				
Proposed Solution	Investigate and replace the (3) humidity sensors with more accurate models per Campus Standards. Check programming on enthalpy control for optimization.				
Cost Estimate:	$1,500	**Payback:**	1 yr	**Implemented?**	☒ Yes ☐ No ☐ Will Be
☐ Handed Off? ☐ To Maintenance ☐ To Engineering	☒ Completed by RCx			☐ Completed by Maintenance	
Additional Notes:					

Energy Savings Project Proposal #5					
Finding	Reheat heating water was being circulated at 180 deg F in the "summer mode" of operation. Pump with VFD was running 100%.				
Proposed Solution	Check the reset schedule if there is one, or add one to reduce required temperature and pump volume.				
Cost Estimate:	Minimum	**Payback:**	IMMED.	**Implemented?**	☒ Yes ☐ No ☐ Will Be
☐ Handed Off? ☐ To Maintenance ☐ To Engineering	☒ Completed by RCx			☐ Completed by Maintenance	

Energy Savings Project Proposal #6					
Finding	The steam condensate line leaving this building appears to have a leak per Joe Roberts of Steam Distribution. Metering data may be biased.				
Proposed Solution	Repair leak to allow accurate, reliable metered data.				
Cost Estimate:	$5,000?	**Payback:**	NA	**Implemented?**	☐ Yes ☐ No ☒ Will Be
☒ Handed Off? ☒ To Maintenance ☐ To Engineering	☐ Completed by RCx			☐ Completed by Maintenance	

Retrocommissioning Final Report

Energy Savings Project Proposal #7					
Finding	Both air handling units were running at 100% fan speed with few patrons in the building. 33% of 4th Floor VAV's were not modulating. 3rd Floor VAVs have similar problem.				
Proposed Solution	Search and find mission to see and fix air leak in pneumatic line.				
Cost Estimate:	Minimal	**Payback:**	IMMED.	**Implemented?**	☒ Yes ☐ No ☐ Will Be
☐ Handed Off? ☐ To Maintenance ☐ To Engineering		☒ Completed by RCx		☐ Completed by Maintenance	

Energy Savings Project Proposal #8					
Finding	Supply Fan static pressures are set constant during occupied and unoccupied hours.				
Proposed Solution	Reduce supply fan static pressures during unoccupied hours, while maintaining building setback conditions.				
Cost Estimate:	FREE	**Payback:**	IMMED.	**Implemented?**	☒ Yes ☐ No ☐ Will Be
☐ Handed Off? ☐ To Maintenance ☐ To Engineering		☒ Completed by RCx		☐ Completed by Maintenance	

Energy Savings Project Proposal #9					
Finding	Existing finned tube radiation pump was operational at 100% during summer months.				
Proposed Solution	Shut down building when outside temperature is above 50 deg F.				
Cost Estimate:	$3,500	**Payback:**	1 yr.	**Implemented?**	☐ Yes ☐ No ☒ Will Be
☒ Handed Off? ☒ To Maintenance ☐ To Engineering		☐ Completed by RCx		☐ Completed by Maintenance	

Energy Savings Project Proposal #10					
Finding	Building has a domestic water booster pump in operation.				
Proposed Solution	Sufficient water pressure in lines from the City. Pump and system can be shutdown and backflow preventer can be removed.				
Cost Estimate:	$500	**Payback:**	< 1 yr.	**Implemented?**	☒ Yes ☐ No ☐ Will Be
☐ Handed Off? ☐ To Maintenance ☐ To Engineering		☐ Completed by RCx		☒ Completed by Maintenance	

Energy Savings Project Proposal #11					
Finding	Chilled water pump was found to be operational in the building, even though it is fed off of the Campus Central Chilled Water Loop.				
Proposed Solution	Shut down pump and open bypass valve.				
Cost Estimate:	Minimal	**Payback:**	IMMED.	**Implemented?**	☒ Yes ☐ No ☐ Will Be
☐ Handed Off? ☐ To Maintenance ☐ To Engineering	☐ Completed by RCx			☒ Completed by Maintenance	

Energy Savings Project Proposal #12					
Finding	Architectural windows have a broken thermal barrier and should still be under warranty to replace or fix.				
Proposed Solution	Pursue warranty item and replace windows with thermal failure.				
Cost Estimate:	Labor Costs	**Payback:**	< 10 yrs.	**Implemented?**	☐ Yes ☐ No ☒ Will Be
☒ Handed Off? ☒ To Maintenance ☐ To Engineering	☐ Completed by RCx			☐ Completed by Maintenance	

Operations & Maintenance Projects

Operations & Maintenance Project #1			
Finding	An existing GCS Controller was found to be defective, not allowing damper control on AHU-2. Affected building pressure and temperature control. Temperatures and alarms were inaccurate.		
Proposed Solution	Replace GCS Controller with GCM Controller to allow accurate readings of digital control devices.		
☐ Handed Off? ☐ To Maintenance ☐ To Engineering	**Implemented?** ☒ Yes ☐ No ☐ Will Be	☐ Completed by Maintenance ☒ Completed by RCx ☐ Completed by Facility	

Operations & Maintenance Project #2			
Finding	Steam condensate meter was at location but not wired.		
Proposed Solution	Wire the meter.		
☐ Handed Off? ☐ To Maintenance ☐ To Engineering	**Implemented?** ☒ Yes ☐ No ☐ Will Be	☐ Completed by Maintenance ☒ Completed by RCx ☐ Completed by Facility	

Operations & Maintenance Project #3			
Finding	Steam condensate is found to be draining to the floor drain rather than pumped back to system as designed.		
Proposed Solution	Valve off drain to sanitary and inspect condensate pump for proper operation.		
☐ Handed Off? ☐ To Maintenance ☐ To Engineering	**Implemented?** ☒ Yes ☐ No ☐ Will Be	☐ Completed by Maintenance ☒ Completed by RCx ☐ Completed by Facility	

Operations & Maintenance Project #4			
Finding	Service light is active on the department water softener which serves the building's humidifiers.		
Proposed Solution	Investigate why and let Maintenance and Building Staff know of situation.		
☒ Handed Off? ☒ To Maintenance ☐ To Engineering	**Implemented?** ☒ Yes ☐ No ☐ Will Be	☐ Completed by Maintenance ☐ Completed by RCx ☐ Completed by Facility	

Operations & Maintenance Project #5			
Finding	Steam valves were found to be leaking.		
Proposed Solution	Repair leaking valves.		
☒ Handed Off? ☒ To Maintenance ☐ To Engineering	**Implemented?** ☒ Yes ☐ No ☐ Will Be	☐ Completed by Maintenance ☐ Completed by RCx ☐ Completed by Facility	

Operations & Maintenance Project #6			
Finding	Chilled water valve was leaking through on AHU-2.		
Proposed Solution	Fix leaking valve.		
☒ Handed Off? ☒ To Maintenance ☐ To Engineering	**Implemented?** ☒ Yes ☐ No ☐ Will Be	☐ Completed by Maintenance ☐ Completed by RCx ☐ Completed by Facility	

Operations & Maintenance Project #7			
Finding	Water chemistry samples have not been taken recently.		
Proposed Solution	Ask Ken Madsen to gather data and adjust chemical properties of water for pipe safety.		
☒ Handed Off? ☒ To Maintenance ☐ To Engineering	**Implemented?** ☒ Yes ☐ No ☐ Will Be	☐ Completed by Maintenance ☐ Completed by RCx ☐ Completed by Facility	

Operations & Maintenance Project #8			
Finding	Reheat system has been found low on water and re-circulating pump running at 100%. The automatic fill was disabled.		
Proposed Solution	Fill system to accurate pressure to allow pump to slow down.		
☐ Handed Off? ☐ To Maintenance ☐ To Engineering	**Implemented?** ☒ Yes ☐ No ☐ Will Be	☒ Completed by Maintenance ☒ Completed by RCx ☐ Completed by Facility	

Operations & Maintenance Project #9			
Finding	Finned Tube Radiation system has been found low on water and re-circulating pump running at 100%. The automatic fill was disabled.		
Proposed Solution	Fill system to accurate pressure to allow pump to slow down.		
☐ Handed Off? ☐ To Maintenance ☐ To Engineering	**Implemented?** ☒ Yes ☐ No ☐ Will Be	☒ Completed by Maintenance ☒ Completed by RCx ☐ Completed by Facility	

Operations & Maintenance Project #10			
Finding	Chilled water meter is an older "annular" type and is located in a place difficult to perform maintenance on.		
Proposed Solution	Install new chilled water meter and located in the supply line above the air handling unit in the straight line of supply chilled water.		
☒ Handed Off? ☒ To Maintenance ☐ To Engineering	**Implemented?** ☒ Yes ☐ No ☐ Will Be	☐ Completed by Maintenance ☐ Completed by RCx ☐ Completed by Facility	

Operations & Maintenance Project #11			
Finding	Many of the transducers, transmitters, and pilot positioners were out of calibration, thereby reading and sending erred values.		
Proposed Solution	Calibrate all the sensors related to the building pressure, outside air temp and humidity, and all sensors and transducers associated with each air handling unit.		
☐ Handed Off? ☐ To Maintenance ☐ To Engineering	**Implemented?** ☒ Yes ☐ No ☐ Will Be	☐ Completed by Maintenance ☒ Completed by RCx ☐ Completed by Facility	

Verification of Savings

The data shows that the solutions implemented at ACES have had serious impacts on the amount of energy consumed and a payback of thousands of dollars. Data was collected over the last year in energy usage and has been compared to this year after the RCx Team visited. Below the difference in monthly usage is noted:

00377 ACES LIBRARY, INFORMATION AND ALUMNI CENTER	2005	JUL	1,552	128,700	821
	2007	JAN	184	132,700	986
		FEB	135	143,700	983
		MAR	528	146,800	976
		APR	555	129,100	287
		MAY	1,250	147,300	821
		JUN	1,631	132,900	808
		JUL	1,791	150,100	994
		AUG	2,172	160,500	1,052
		SEP	1,577	131,600	868
		OCT	1,101	144,300	977
		NOV	474	137,900	712
		DEC	428	148,000	1,227
	2008	JAN	537	125,700	539
		FEB	449	132,600	1,246
		MAR	528	148,700	1,247
		APR	904	143,700	1,118
		MAY	1,150	136,600	1,029
		JUN	1,090	121,400	808

Figure 1: Energy Savings since RCx Implementations

These savings are estimated to amount to $7,950 according to the current utility rates for the actual two months. The expected annual savings are approximated to approach $75,000. This also represents an energy savings of 8% over last year.

The Path to Success – Maintenance of Savings

A brand new vehicle that leaves the factory is perfect in every way; it's been tested, proven, crashed, and trashed. When the proud new owner drives away, there is an air of confidence that the pieces will work in harmony and deliver the satisfaction they expect. However, this satisfaction will only continue as long as the Owner is responsible and learns to maintain its parts. Proud automobile ownership comes from a commitment to keep the auto in shape and tuned per the manufacturer's instructions.

Retrocommissioning has a very similar path. A brand new building, although having its quirks, still possess' new equipment, new parts, and new warranties. However, the following year the equipment in the building needs care and preventative maintenance. Sometimes years or decades go by before a building is approached with the idea of restoring, or even improving upon, its efficiency. Retrocommissioning puts the building back on the path to success, giving the Owner pride to own that real estate. After the Team leaves, the building is once again under the jurisdiction of the Facility Operators. It is you the reader who must continue on the legacy of maintaining the building system in its best condition possible, operating at its peak efficiency, or better.

To maintain the building at its peak efficiency, it will require help from "mechanics", specifically trained route mechanics who know the building and its method of operation. It will require following up on preventative maintenance tasks or creating new ones to take care of repetitive causes contributing to system inefficiencies. This may require additional funds, but much less than the inefficiencies will. Control systems will need to be calibrated and checked. Utility data should be trended, kept monthly for seasonal comparisons, to review and alert the operator to any deviations. The operator will then need to understand what to do to maintain the energy savings and if not, to be able to speak with someone who can assist. The Engineering Division of Facilities and Services is available when the need arises.

The Facility Operator and assistants are in the positions to improve upon, or optimize the work performed by the Retrocommissioning Team. There are many other opportunities for savings. That event was a turning point. The operators should consider implementing steps outlined in the publication LEED for Existing Buildings which is available online at www.usgbc.org. Since there are many other buildings on campus to attend to, it may well be the only visit during this decade. Therefore, operator, assistants, and route mechanics: take your stewardship seriously! Treat the building and its systems as a brand new automobile. Commitment will lead the building and its caretakers on the Path to Success.

OPERATIONS & MAINTENANCE PLAN 05

This section is dedicated to the men and women operating and maintaining the facility, as well as the folks at F&S who assist in the building's systems functioning smoothly and efficiently. This section shall contain all items required to operate and maintain the building, less the occupancy schedules which are in the Owner's realm of activity.

Site Event Log

This page is intended to be used to **record** site events such as water testing, maintenance visits, re-calibration of the controls and all such events that affect the building's systems overall performance. Accurate records produce energy and economic savings and allow the transfer of pertinent information to the next party. The first line below is an example.

Date	Site Event	By Whom	Company
1/25/2008	*Calibrated Controls in Room 1056*	*John Smith*	*TC Route Mechanic*

Operating & Maintenance Plan

Purpose of Operation and Maintenance

Building O&M is the ***ongoing*** process of sustaining the performance of building systems according to design intent, the owner's or occupants' changing needs, and optimum efficiency levels. The O&M process helps sustain a building's overall profitability by addressing tenant comfort, equipment reliability, and efficient operation. Efficient operation, in the context of O&M, refers to activities such as scheduling equipment and optimizing energy and comfort-control strategies so that equipment operates only to the degree needed to fulfill its intended function. Maintenance activities involve physically inspecting and caring for equipment. **These O&M tasks, when performed systematically, increase reliability, reduce equipment degradation, and sustain energy efficiency. These are vital for energy savings to continue over the life of the building.**

It is the intent of this document to be dynamic, used to perform the building operation and preventative maintenance (PM) for functionality and sustainability. If there is a suggestion, please revise this form and submit the improvement to the Operations and Maintenance Staff at Facilities and Services. That information could be included on future editions of this document and in other facilities on campus.

ACES Library, Info. & Alumni Center is a building dedicated to the preservation of invaluable collections of mixed media and rare book collections. This facility requires **optimum** temperature and humidity control over the varying facility activities. With these ultimate objectives in mind, the necessity is laid upon the operations and maintenance staff to follow through in all required responsibilities throughout the facility. This may well require additional part-time or full-time assistance from a third party or by in-house means and an investment in the required tools or computers.

The primary energy savings goals for this site are to limit energy use where possible, taking full advantage of economizer function by maximizing the use of outdoor air for cooling and to limit air conditioning during unoccupied hours, except where needed. An O&M service plan for each piece of equipment should eventually be included in this evolving document stating the tasks to be performed, the frequency, and the expected time to perform them.

Prerequisites

The air handling units at this facility are employing DDC controls with pneumatic actuation. Therefore, it is **imperative** that the call made to F&S requests the proper mechanics, otherwise without understanding the systems can regress to operating inefficiently. When the route mechanic or other is called, he/she must possess these two prerequisites to work on the DDC systems:

- **MUST** have access to a laptop or personal computer which is connected to the DDC System in the building.
- **MUST** have experience in working with DDC software and have password access to the logic.

Operations Tasks

Operations of this building are dependent upon sequences of operation found in the tab "Control Diagrams and Sequences of Operation". These sequences were developed or reviewed and improved by the Retrocommissioning Team during their visit to the building in June, 2008. Any questions as to the operations can be directed to the DDC Controls Group or Retrocommissioning for assistance.

Unique to DDC systems is the ability to *trend* data. This operation allows the computer to take "snap shots" of the system or sensor at specified time intervals (down to each minute). This data can then later be observed in excel format or by graphical display. This trending is very valuable to review system performance and to reveal non-optimal conditions. Reviewing this data will assist the building operators in providing a more responsive zone and increased energy savings. Trending can always be added to a system upon request to the DDC Controls Group at Facilities and Services.

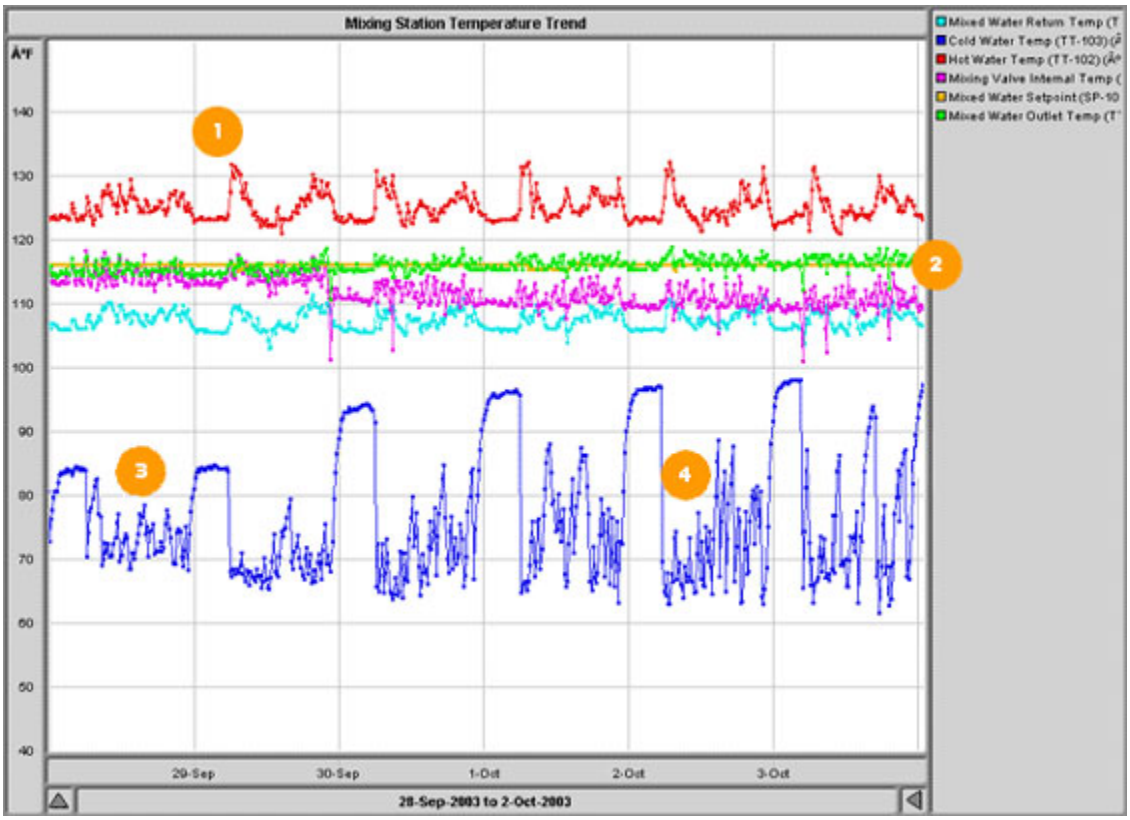

Figure 1: Example of Trend Data

Preventive Maintenance Tasks

These Maintenance Tasks are currently scheduled work orders which are sent to respective shops for completion. Please note when these are completed on the 'Site Event Log' at the beginning of this section.

Currently Scheduled Preventative Maintenance (PM) Tasks

CREW	NAME	EQUIPMENT	TASK_ID	FREQ	EST MEN	EST HRS	DESC1
03	Electric Repair & Maintenance	00377-HMDFR-AHU1	CLEAN PROBE	365	1	3	CLEAN PROBE
03	Electric Repair & Maintenance	00377-HMDFR-AHU2	CLEAN PROBE	365	1	2	CLEAN PROBE
03	Electric Repair & Maintenance	00377-MOTORS	OIL MOTORS PMPS	182	1	2	CHECK COUPLING, MOTOR MOUNTS, OVERLOAD HEATERS, FUSE SIZE, ELECTRICAL
13	Garage	31006-01	GENERATOR MAINT	182	2	2	DIESEL OIL FILTER 51792(2) GAL OIL 17.5 FUEL 33674
23	Pipefitter	00377-HMDFR-AHU1	ACTIVATE	365	1	2	ACTIVATE HUMIDIFIER
23	Pipefitter	00377-HMDFR-AHU1	SHUT OFF	365	1	14	SHUT OFF AND CLEAN HUMIDIFIER
23	Pipefitter	00377-HMDFR-AHU2	ACTIVATE	365	1	2	ACTIVATE HUMIDIFIER
23	Pipefitter	00377-HMDFR-AHU2	SHUT OFF	365	1	15	SHUT OFF AND CLEAN HUMIDIFIER
25	Electric High Voltage, S & C	31006-01	GENERATOR	030	1	6	MONTHLY MAINTENANCE
25	Electric High Voltage, S & C	08257	INSPECT	365	1	16	INSPECT AND CLEAN LOAD CENTER.
25	Electric High Voltage, S & C	00377-XFMR-VAULTS	TRANSFORMER VLT	182	1	4	INSPECT AND MAINTAIN TRANSFORMER VAULT.
26	Water Station	00377-SOFTENER	ACTIVATE	365	1	24	ACTIVATE SOFTENER THAT SERVES HUMIDIFIERS AND MAINTAIN FOR THE
26	Water Station	00377-SOFTENER	SHUT OFF	365	1	2	SHUT OFF SOFTENER THAT SERVES HUMIDIFIERS.

(Continues on following page)

Currently Scheduled Preventative Maintenance (PM) Tasks

CREW	NAME	EQUIPMENT	TASK_ID	FREQ	EST MEN	EST HRS	DESC1
33	Elevator	00377-E1	5YR SAFETY TEST	5YR	1	11	PERFORM 5 YEAR FULL LOAD SAFETY TEST. /EE
33	Elevator	00377-E1	ANNL SFTY TEST	365	1	2	ANNUAL SAFETY TEST AS PER A17.1 AND ANNUAL CABLE INSPECTION. /EE
33	Elevator	00377-E2	PRESSURE TEST	365	1	6	ANNUAL HYD PRESSURE RELIEF TEST PER A17.1/CHANGE BATTERY IN CONTROLLER
34	Roofing	00377-ROOF	INSPECTION	365	1	4	INSPECT ALL RUBBER ROOFS FOR DAMAGE. REPORT FINDINGS TO STEVE MAST (OR
35	Refrigeration	00377-AC 1	MAINTENANCE	090	1	3	MAINTAIN LIEBERT. ROOM IS IN A SECURED AREA. CONTACT JEANA MCALLISTER
35	Refrigeration	00377-CWCOILS	SUMMER STARTUP	365	1	5	PREPARE CHILL WATER COILS FOR AHU'S FOR SUMMER OPERATION. /JS
35	Refrigeration	00377-CWCOILS	WINTER OPERATN	365	1	3	PREPARE CHILL WATER COILS FOR AHU'S FOR WINTER OPERATION. /JS
41	Temperature Control	00377-AIR COMP-BA-1	AIR COMP YEARLY	030	1	1	COMPRESSOR MAINTENANCE
55	Electric Utility, Systems & Controls	00377-CHW-SENSOR	TEST SENSOR	365	1	2	DDC CHECK & CALIBRATE CHILLED WATER SUPPLY & RETURN SENSORS //SM
55	Systems & Controls	00377-VFD	VFD MAINTENANCE	2YR	1	12	VFD MAINTENANCE

Recommended Preventive Maintenance Tasks

Each time these are completed, it should be noted at the front of the Systems Manual on the "Site Event Log" for recording purposes.

Task to be performed	Frequency	Time Allotment	Requires a Shutdown?
Review plumbing fixtures & equipment for water or waste leaks. Fix or repair as soon as possible.	Monthly	2 hours	No
Review operation of return, outdoor and exhaust air dampers at each air handling unit for proper stroking, tight closing, and full range operability.	Annually	1 hour / AHU	Yes
Review the pneumatic actuators at each valve and damper associated with each air handling unit (AHU) for proper actuation.	Annually	1.5 hours / AHU	No
Review and calibrate each sensor, transmitter, pneumatic transducer, and pilot positioner at each respective air handling unit (AHU).	Annually	3 hours / AHU	No
Review and calibrate the static sensors on supply fans and the building pressure sensor.	Annually	2 hours	No
Review filters conditions. Filters should be constructed of glass fibers (NOT synthetic) and have a minimum MERV rating of 13. These should be changed per manufacturer's recommendations.	Semi-Annually	2 hours	Yes
Review the pressure drop across the water and steam coils. Inspect the cleanliness by spraying a portion with compressed air. Visual inspection is NOT sufficient. Clean coils with compressed air or by vacuuming if dirty.	Annually	16 hours	Yes
Calibrate the chilled water metering system.	Annually	1 hour	No
Visually inspect the steam entrance valves and condensate metering system. Check for leaks and repair. Calibrate the meter.	Annually	1 hour	No
Review the heat exchangers for proper operation.	Annually	1 hour	No
Review the steam condensate traps throughout the facility for leaks and steam loss. Repair all faulty traps as soon as possible.	Annually	4 hours	No
Review the insulation on the chilled water, heating water and steam piping. If lacking or deteriorating, replace.	Annually	2 hours	No
Clean the tubes in the heat exchanger's bundles once every ten years minimum.	Decadally	8 hours	Yes
Review the efficiency of the plumbing fixtures in comparison with new products. Consider replacing the fixtures with higher efficient fixtures if reasonable.	Decadally	1 hour	No

Operating & Maintenance Plan

Task to be performed	Frequency	Time Allotment	Requires a Shutdown?
Review the air handling units and associated equipment. Many problems? Many calls? High amount of maintenance? Recommend replacing? Submit request to Facilities and Services for a proper review and recommendation from engineering.	Decadally	2 hours	No
Test the fire alarm system.	Annually	1 hour	No
Review and test operation of each VAV controller	5 years	0.5 hour / VAV	No
Inspect and replace as necessary Hawkeye current sensors, isoverters and relays.	Annually	8 hours	No

Plumbing & Fire Protection 06

This section is dedicated to the plumbing and fire protection tradesmen and associated engineers. It is here for any data related to the functioning, replacement, and energy consumption by the plumbing and fire protection systems in the building.

HVAC 07

This section is dedicated to the heating, ventilating and air conditioning tradesmen and associated engineers. It is here for any data related to the functioning, replacement, and energy consumption by the HVAC systems in the building.

Industrial Belt Design - Drive Detail Report

Design Flex® Pro by the Gates Corporation

Designed For: MIKE MONTGOMERY
UNIVERSITY OF ILLINOIS
CHAMPAIGN, Illinois
United States
mike.montgomery@motion-ind.com

Provided By: STEVE SMALL
GATES CORPORATION
1359 Jeffco Blvd.
PO Box 707
Arnold, Missouri 63010
United States
ssmall@gates.com
636-287-9100 Phone
303-744-4693 Fax

Application: **ACES Library_AHU-2 RETURN FAN_Polychain Carbon**

INPUT

Drive Information

Speed Ratio:	2.15 Down
Input Load:	40 hp
Service Factor:	1.4
Design Power:	56 hp
Center Distance:	40.32 in +/-10%
Motor Standards:	NEMA Electric Motor, 324T frame

	DriveR	DriveN
RPM:	1780.0	828.4 +/-4%
Shaft Diameter:	2.125 in	2.9375 in

Bushings Checked: Any
Belts Checked: Poly Chain Carbon, PowerGrip GT2

SELECTED DRIVE

Belt Type: **Poly Chain Carbon - 14M**

Speed Ratio: **2.09 Down**
dN RPM: **850.4**
Rated Load: **123.27 hp**
Belt Pull: **482 lb**

Center Distance: 43.21 in
Install/Take-Up Range: 41.82 in to 43.26 in

Noise: 74 dB @ 1276 Hz

	Belt	DriveR	DriveN
Part No:	14MGT-3136-20	14MX-43S-20	14MX-90S-20
Product No:	9274-4224	7719-2043	7719-2090
Top Width:	--	1.44 in	1.44 in
Installed Weight:	1.1 lb	12 lb	41 lb
Rim/Belt Speed:	3515 ft/min	3464 ft/min	3491 ft/min
RPM:	341.7	1780.0	850.4
Bushing Part No:	--	2517 2 1/8	3525 2 15/16
Bushing Product No:	--	7858-3202	7858-5215
Bore:	--	0.5 in - 2.6875 in	1.1875 in - 3.9375 in
Pitch Diameter:	--	7.54 in	15.79 in

Energy Savings: 13327 - 14076 KWh/yr, for a savings of $932.92 - $985.33/yr

TENSION

	New Belt	Used Belt
Static Tension (Per rib/strand):	263 to 287 lb	191 to 215 lb
Rib/Strand Deflection Distance:	0.7 in	0.7 in
Rib/Strand Deflection Force:	21 to 23 lb	17 to 18 lb
Sonic Tension Meter:	1169 to 1275 N	850 to 957 N
Belt Frequency:	39 to 41 Hz	34 to 36 Hz

When planning to re-install used belts, measure and record the tension before removing and re-install at the recorded tension.

505C/507C Model STM Settings: Weight: 7.9 g/m,Width: 20 mm/#R, Span: 1092 mm

NOTES

- Drive over-designed and efficiency may be reduced.
- The DriveN pulley/bushing weight exceeds 50 lb. Exercise care during installation.

- This report: (1) only applies to Gates' products; (2) contains confidential information; (3) may only be disclosed to support the sale or maintenance of our products; and (4) is not a guarantee of performance.
- Buyer has sole responsibility for the selection and testing of products for any intended use which may not include flight-related aircraft applications.

Industrial Belt Design - Drive Detail Report

Design Flex® Pro by the Gates Corporation

Designed For: MIKE MONTGOMERY
UNIVERSITY OF ILLINOIS
CHAMPAIGN, Illinois
United States
mike.montgomery@motion-ind.com

Provided By: STEVE SMALL
GATES CORPORATION
1359 Jeffco Blvd.
PO Box 707
Arnold, Missouri 63010
United States
ssmall@gates.com
636-287-9100 Phone
303-744-4693 Fax

Application: **ACES Library_AHU-2 SUPPLY FAN_Polychain Carbon**

INPUT

Drive Information

Speed Ratio:	1.74 Down
Input Load:	100 hp
Service Factor:	1.4
Design Power:	140 hp
Center Distance:	38.28 to 46.79 in
Motor Standards:	NEMA Electric Motor, 404T frame

	DriveR	DriveN
RPM:	1790.0	1030.1 +/-4%
Shaft Diameter:	2.875 in	2.9375 in

Bushings Checked: Any
Belts Checked: Poly Chain Carbon, PowerGrip GT2

SELECTED DRIVE

Belt Type: **Poly Chain Carbon - 14M**

		Belt	DriveR	DriveN
	Part No:	14MGT-3136-37	14MX-45S-37	14MX-80S-37
Speed Ratio: **1.78 Down**	Product No:	9274-5224	7719-3045	7719-3080
dN RPM: **1006.9**	Top Width:	--	2.11 in	2.11 in
Rated Load: **238.77 hp**	Installed Weight:	2.0 lb	16 lb	49 lb
Belt Pull: **1146 lb**	Rim/Belt Speed:	3700 ft/min	3648 ft/min	3671 ft/min
	RPM:	359.6	1790.0	1006.9
Center Distance: 44.40 in	Bushing Part No:	--	3020 2 7/8	3525 2 15/16
Install/Take-Up Range: 42.27 in to 44.45 in	Bushing Product No:	--	7859-6214	7858-5215
	Bore:	--	0.875 in - 3.25 in	1.1875 in - 3.9375 in
Noise: 79 dB @ 1343 Hz	Pitch Diameter:	--	7.90 in	14.04 in

Energy Savings: 32968 - 34417 KWh/yr, for a savings of $2,307.75 - $2,409.18/yr

TENSION

	New Belt	Used Belt
Static Tension (Per rib/strand):	620 to 676 lb	451 to 507 lb
Rib/Strand Deflection Distance:	0.7 in	0.7 in
Rib/Strand Deflection Force:	48 to 52 lb	38 to 41 lb
Sonic Tension Meter:	2758 to 3009 N	2006 to 2257 N
Belt Frequency:	43 to 45 Hz	37 to 39 Hz

When planning to re-install used belts, measure and record the tension before removing and re-install at the recorded tension.

505C/507C Model STM Settings: Weight: 7.9 g/m,Width: 37 mm/#R, Span: 1125 mm

NOTES

- The DriveR pulley bushing requires a shallow keyseat.
- The DriveN pulley/bushing weight exceeds 50 lb. Exercise care during installation.

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- Buyer has sole responsibility for the selection and testing of products for any intended use which may not include flight-related aircraft applications.

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-1

LOCATION: Basement Mechanical Room

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Cooling Max	Heating Max	Static Pressure Max/Min	Cooling Max	Heating Max	Clg/Htg Min	AHU SP	REMARKS
2	U1-LL-1				0		1300		.07/0					MECH ROOM - NO DUCT WORK ATTACHED/MOSTLY CLOSED
31	U1-LL-2		6	12	0.5		184	0	.10/0					CLOSET NO ACCESS
35-1	U1-LL-3	12			0.7854		415	206	.27/.04	349	165			Reset Min
35-2		12			0.7854		415	206		360	160			
35-3		12			0.7854		150	75						Janitor's Closet
35-4		8			0.34907		150	75						Janirot's Storage
Total							1130	562		709	325			
Stair 30-1	U1-LL-4	12			0.7854		100	50	.34/.04	97	45			2-RA Grilles 563 & 554
30-2		8			0.34907		230	125		216	85			
30-3		8			0.34907		230	125		222	93			
30-4		8			0.34907		230	125		229	94			
30-5		8			0.34907		230	125		278	111			
30-6		8			0.34907		230	125		244	101			
30-7		8			0.34907		230	125		271	102			
Total							1480	800		1557	631			97% MAX
29-1	U1-LL-5	8			0.34907		230	115	.25/.04	231	96			
29-2		8			0.34907		230	115		231	98			
29-3		8			0.34907		230	115		235	93			
29-4		8			0.34907		230	115		219	90			
29-5		8			0.34907		230	115		233	94			
29-6		8			0.34907		230	115		238	96			
Total							1380	690		1387	567			106% MAX
27-1	U1-LL-6	8			0.34907		147	80	.20/.04	0	0			Removed out of Rm. 27
28-2		8			0.34907		106	56		0	123			One Grille in Rm. 28
Total							253	136		0	123			
5	U1-LL-7	10			0.54542		300	0	XX	250	0			R.A-87

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-1

LOCATION: Basement Mechanical Room

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Cooling Max	Heating Max	Static Pressure Max/Min	Cooling Max	Heating Max	Clg/Htg Min	AHU SP	REMARKS
5	U1-LL-7-A	10			0.54542		300	0	XX	246	0			R.A-227
24-1	U1-LL-8	10			0.54542		248	124	.25/.04	229	83			HOSES OFF HI & LO
24-2		10			0.54542		248	124		242	81			
24-3		10			0.54542		248	124		246	89			BOX OUT OF CONTROL-FIX
24-4		10			0.54542		248	124		248	80			CHANGED CONTROLLERS
24-5		10			0.54542		248	124		253	86			
24-6		10			0.54542		248	124		240	83			
24-7		10			0.54542		248	124		266	81			
24-8		10			0.54542		248	124		239	89			
24-9		10			0.54542		248	124		228	84			
24-10		10			0.54542		248	124		245	85			
Total							2480	1240		2436	841			98% MAX
26	U1-LL-9	8			0.34907		350	74	XX					VAV's DIRECTLY ABOVE COMPUTER SERVERS. COULD NOT GET TO. INFORMED DAVID TO WATCH FOR WATER REHEAT LEAKS IN FUTURE
26	U1-LL-9-A	10			0.54542		300	0	XX					
25	U1-LL-10	8			0.34907		106	54	XX					
1.-1	U1-LL-11	8			0.34907		230	115	.25/.04	220	94			
6.-2		8			0.34907		147	74		131	50			
7.-3		8			0.34907		230	115		221	94			
Total							607	304		572	238			94% MAX
8.-1	U1-LL-12	8			0.34907		156	78	.26/.04	153	63			
8.-2		8			0.34907		156	78		159	64			
8.-3		8			0.34907		156	78		152	68			
8.-4		8			0.34907		156	78		149	66			
8.-5		8			0.34907		156	78		144	67			
8.-6		8			0.34907		156	78		145	62			
8.-7		8			0.34907		156	78		153	71			
8.-8		8			0.34907		156	78		150	67			
8.-9		8			0.34907		156	78		154	70			
8.-10		8			0.34907		156	78		146	62			
8.-11		8			0.34907		156	78		152	73			
8.-12		8			0.34907		156	78		147	69			
Total		8			0.34907		1872	936		1804	802			96% MAX

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-1

LOCATION: Basement Mechanical Room

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Cooling Max	Heating Max	Static Pressure Max/Min	Cooling Max	Heating Max	Clg/Htg Min	AHU SP	REMARKS
16-1 Transformer	U1-LL-13	12			0.7854		184	0	XX					NO REHEAT--DID NOT ADJUST OR READ GRILLES
12.-3		24			3.14159		1104	0						
13-3		12			0.7854		184	0						
14-4		12			0.7854		184	0						
13-5		18			1.76715		552	0						
Total							2208	0						
23-1	U1-LL-14	8			0.34907		230	115	.275/.033	212	75			BOX FOUND OUT OF CONTROL--WIDE OPEN--REPLACED CONTROLLER-RET 427/430
23-2		8			0.34907		230	115		214	73			
23-3		8			0.34907		230	115		227	70			
23-4		8			0.34907		230	115		212	72			
23-5		8			0.34907		230	115		223	74			
23-6		8			0.34907		230	115		218	76			
Total							1380	690		1306	440			
Stair 22-1	U1-LL-15	12			0.7854		92	46	.28/.04	95	52			RET 483/462
22-2		8			0.34907		230	115		223	85			
22-3		8			0.34907		230	115		217	87			
22-4		8			0.34907		230	115		240	90			
22-5		8			0.34907		230	115		240	86			
22-6		8			0.34907		230	115		244	92			
22-7		8			0.34907		230	115		241	86			
Total							1472	736		1500	578			
17-1 Mens RR	U1-LL-16	12			0.7854		414	207	.24/.04	389	211			REHEAT NOT WORKING
17-2 Mens RR		12			0.7854		414	207		399	226			
20-3		12			0.7854		92	46		95	53			
Total							920	460		883	490			

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-1

LOCATION: FIRST FLOOR

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Cooling Max	Heating Max	Static Pressure Max/Min	Cooling Max	Heating Max	Clg/Htg Min	AHU SP	REMARKS
114-1 Womens RR	GL-17	8			0.34907		207	104	XX	176	73			73% MIN
114-2 Womens RR		8			0.34907		207	104		172	79			
Total							414	208		348	152			83% MAX
109-1	GL-18	8			0.34907		138	69	.22/.04	128	57			FOUND NOT WORKING--
109-2		8			0.34907		138	69		132	60			WIDE OPEN--REPLACED
109-3		8			0.34907		138	69		128	63			CONTROLLER
109-4		8			0.34907		239	120		240	115			
109-5		8			0.34907		239	120		238	118			
109-6		8			0.34907		138	69		133	65			
109-7		8			0.34907		239	120		240	121			
Total							1269	636		1239	599			97% MAX
107-1	GL-19	10			0.54542		331	165	XX	283	122			DID BACK THIS OFF
107-2		10			0.54542		331	165		291	115			
107-3		10			0.54542		359	180		277	119			
Total							1021	510		851	356			
107-1	GL-20	10			0.54542		331	165	.24/.04	310	118			RESET MIN
107-2		10			0.54542		331	165		311	131			
106-3 Kitchen		6			0.19635		92	46		80	30			
107-4		10			0.54542		331	165		311	132			
107-5		10			0.54542		331	165		299	129			
Total							1416	706		1311	540			92% MAX
105-1	GL-21	6			0.19635		138	69	.23/.04	121	43			RESET MIN
105-2		10			0.54542		276	138		220	102			
105-3		10			0.54542		276	138		213	102			
Total							690	345		554	247			80% MAX

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-1

LOCATION: FIRST FLOOR

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Cooling Max	Heating Max	Static Pressure Max/Min	Cooling Max	Heating Max	Clg/Htg Min	AHU SP	REMARKS
113	GL-22	24			3.14159		368	184	XX	228				LOBBY
104-1	GL-23	8			0.34907		184	92	.21/.04	179	88			RESET MIN--97% MIN
104-2		8			0.34907		184	92		175	78			
104-3		10			0.54542		322	161		302	166			
104-4		8			0.34907		184	92		181	97			
104-5		10			0.54542		322	161		287	151			
Total							1196	598		1124	580			94% MAX
136-1	GL-24	10			0.54542		276	138	XX	241	98			RESET MIN--71% MIN
136-2		10			0.54542		276	138		243	99			
Total							552	276		484	197			88% MAX
132-1 MAIL RM	GL-25	6			0.19635		92	46	XX	61	47			
124-2 RECEIVING		8			0.34907		230	115		177	124			
Total							322	161		238	171			
129	GL-26	8			0.34907		147	74	XX	175	93			BOX TOO HIGH
128	GL-27	8			0.34907		175	88	XX	180	100			BOX TOO HIGH--REHEAT NOISY
127	GL-28	8			0.34907		161	81	XX	177	108			BOX TOO HIGH
126	GL-29	8			0.34907		138	69	XX	159	105			BOX TOO HIGH
125	GL-30	8			0.34907		161	81	XX	185	105			ROLLED T-STATS--DID NOT ADJUST ANY BOXES 26-30
130-1	GL-31	6			0.19635		83	42	XX	82	48			BOX TOO HIGH--LUCKY IT WORKS
130-2		6			0.19635		83	42		86	47			
130-3		6			0.19635		83	42		85	43			
130-4		6			0.19635		83	42		88	44			
130-5		6			0.19635		83	42		81	46			
130-6		6			0.19635		83	42		78	40			
Total							498	252		500	268			

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-1

LOCATION: FIRST FLOOR

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Cooling Max	Heating Max	Static Pressure Max/Min	Cooling Max	Heating Max	Clg/Htg Min	AHU SP	REMARKS
113	GL-32	24			3.14159		368	184	XX	312				
122-1	GL-33	8			0.34907		106	53	XX	104	65			P.D. TOO HIGH TO GET TOO--BOX WORKS
116-2		8			0.34907		110	55		98	52			
Total							216	108		202	117			
124	GL-34	8			0.34907		184	92	XX	187	126			
120	GL-35	8			0.34907		230	115	X/.04					FOUND OUT OF CONTROL--REPLACED CONTROLLER--BOX 35 STILL NOT WORKING--OUT OF CONTROL, FEAR GRID BROKEN--VAV BOX IS IN WALL--NEED WORK-VICE DEANS OFFICE BOX IS WIDE OPEN
	GL-36	8			0.34907		115		XX	225	103			
119	GL-37	8			0.34907		166	83	.14/.04	161	88			FOUND OUT OF CONTROL--REPLACED CONTROLLER
118	GL-38	8			0.34907		129	65	XX	133	97			BOX TOO HIGH--CAN'T ADJUST NUTS--DID STROKE
117	GL-39	8			0.34907		184	92	.17/.03	162	86			88% MAX--REPLACED CONTROLLER

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-2

LOCATION: 2nd Floor VAV Boxes

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
	BOX						Cooling	Heating	Static Pressure	Cooling	Heating	Clg/Htg	AHU	
ROOM NUMBER	NUMBER	DIA	H	W	SQFT	Mult	Max	Max	Max/Min	Max	Max	Min	SP	REMARKS
204-1		10			0.54542		285	142		280	129			
204-2		10			0.54542		285	142		264	117			
STAIR-1-3			6	12	0.5		100	50		103	60			
204-4	U2-2-41	10			0.54542		285	142	.20/.03	270	123			
204-5		10			0.54542		285	142		263	116			
204-6			6	12	0.5		100	50		97	48			
TOTAL							1340	668		1277	593			
204-1			6	48	2		150	75		139	61			STAT NEEDS CHECKED,
204-2			6	48	2		150	75		125	53			REHEAT RUNS A LOT
204-3			6	48	2		150	75		145	61			
204-4	U2-2-42		6	48	2		150	75	.26/.04	133	51			
204-5			6	48	2		150	75		141	57			
204-6			6	48	2		150	75		159	67			
TOTAL							900	450		842	350			
203-1		10			0.54542		300	150		215	115			FOUND BOX OUT OF
203-2		10			0.54542		300	150		218	122			CONTROL, REPLACED
203-3		10			0.54542		300	150		220	111			CONTROLLER. COULD BE
203-4		10			0.54542		300	150		217	110			TURNED UP IF NEEDED
203-5		10			0.54542		300	150		269	132			NOT AT MAX.
203-6		10			0.54542		300	150		219	113			
203-7	U2-2-43	10			0.54542		300	150	.44/.04	260	127			
203-8		10			0.54542		300	150		222	112			
203-9		10			0.54542		300	150		218	117			
203-10		10			0.54542		300	150		230	124			
203-11		10			0.54542		300	150		262	129			
203-12		10			0.54542		300	150		230	118			
TOTAL							3600	1800		2780	1430			

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-2

LOCATION: 2nd Floor VAV Boxes

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
	BOX						Cooling	Heating	Static Pressure	Cooling	Heating	Clg/Htg	AHU	
ROOM NUMBER	NUMBER	DIA	H	W	SQFT	Mult	Max	Max	Max/Min	Max	Max	Min	SP	REMARKS
203-1		10			0.54542		350	175		321	141			CONTROL, WIDE OPEN,
203-2			6	48	2		150	75		139	57			FOUND BAD POLY TUBE
203-3			6	48	2		150	75		149	67			AND REPAIRED IT.
203-4			6	48	2		150	75		150	72			
203-5	U2-2-44		6	48	2		150	75	.33/.04	161	66			
203-6			6	48	2		150	75		131	58			
203-7			6	48	2		150	75		156	76			
203-8		10			0.54542		350	175		343	124			
TOTAL							1600	800		1550	661			
203-1			6	48	2		150	75		174	80			
203-2			6	48	2		150	75		170	79			BOX WILL NOT CONTROL IF
203-3			6	48	2		150	75		155	76			MIN. IS SET ANY LOWER
203-4	U2-2-45		6	48	2		150	75	.25/.04	135	71			
203-5			6	48	2		150	75		145	68			
203-6			6	48	2		150	75		184	80			
TOTAL							900	450		963	454			
203-1		10			0.54542		300	150		282	134			
203-2		10			0.54542		300	150		273	142			
STAIR-2-3			6	12	0.5		100	50		101	51			FOUND BOX OUT OF CONTROL, REPLACED
203-4	U2-2-46	10			0.54542		300	150	.20/.04	263	151			CONTROLLER, AND FOUND
203-5		10			0.54542		350	175		335	166			HOSED OFF OF GRID
203-6		10			0.54542		100	50		98	56			INSIDE BOX, REPAIRED IT.
TOTAL							1450	725		1352	700			DAMPER MOSTLY CLOSED
201-1		8			0.34907		150	75		148	66			CONTROL, FOUND THE
201-2	U2-2-47	8			0.34907		150	75	.20/.04	155	71			HOSES OFF OF THE GRID
TOTAL							300	150		303	137			INSIDE OF THE BOX.

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-2

LOCATION: 2nd Floor VAV Boxes

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
							Cooling	Heating	Static Pressure	Cooling	Heating	Clg/Htg	AHU	
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Max	Max	Max/Min	Max	Max	Min	SP	REMARKS
221-1	U2-2-48	8			0.34907		225	112	.53/.04	211	68			
221-2		8			0.34907		225	112		209	65			
TOTAL							450	224		420	133			
220-1	U2-2-49	8			0.34907		175	87	.30/.04	175	82			
220-2		8			0.34907		175	87		164	81			
TOTAL							350	174		339	163			
219	U2-2-50	8			0.34907		250	125	.40/.04	201	125			
218	U2-2-51	8			0.34907		250	125	.21/.04	220	72			
215-1	U2-2-52	8			0.34907		200	100	.50/.06	186	62			
215-2		8			0.34907		200	100		188	58			
215-3		8			0.34907		200	100		183	59			
215-4		8			0.34907		200	100		139	54			
TOTAL							800	400		696	233			
216-1	U2-2-53	8			0.34907		250	125	.32/.04	229	70			
216-2		8			0.34907		250	125		232	68			REHEAT NOT WORKING,NO
216-3			6	48	2		150	75		170	30			WATER FLOW.
216-4			6	48	2		150	75		154	43			
216-5			6	48	2		150	75		145	45			
216-6			6	48	2		150	75		170	47			
TOTAL							1100	550		1100	303			
211-1	U2-2-54	12			0.7854		400	200	.22/.04	406	193			
211-2		12			0.7854		300	150		291	131			
211-3		12			0.7854		300	150		283	154			
211-4		12			0.7854		300	150		272	136			
TOTAL							1300	650		1252	614			

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-2

LOCATION: 2nd Floor VAV Boxes

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
							Cooling	Heating	Static Pressure	Cooling	Heating	Clg/Htg	AHU	
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Max	Max	Max/Min	Max	Max	Min	SP	REMARKS
211-1	U2-2-55	8			0.34907		200	100	.32/.04	206	75			
211-2		8			0.34907		200	100		210	75			
211-3			6	48	2		150	75		153	67			
211-4			6	48	2		150	75		145	67			
211-5			6	48	2		150	75		151	60			
211-6			6	48	2		150	75		140	51			
211-7			6	48	2		150	75		145	61			
211-8			6	48	2		150	75		142	51			
211-9			6	48	2		150	75		158	75			
211-10			6	48	2		150	75		140	59			
TOTAL							1600	800		1590	641			
208-1	U2-2-56	8			0.34907		225	112	.44/.04	198	63			FOUND A LOT OF REHEAT
208-2		8			0.34907		225	112		206	67			NOISE.
TOTAL							450	225		404	130			
207-1	U2-2-57	8			0.34907		200	100	.64/.07	161	54			FOUND A LOT OF REHEAT
206-2		8			0.34907		100	50		137	37			NOISE, STAT NEEDS
206-3		8			0.34907		100	50		143	45			CHECKED
TOTAL							400	200		441	136			

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-2

LOCATION: 3rd Floor VAV Boxes

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
	BOX						Cooling	Heating	Static Pressure	Cooling	Heating	Clg/Htg	AHU	
ROOM NUMBER	NUMBER	DIA	H	W	SQFT	Mult	Max	Max	Max/Min	Max	Max	Min	SP	REMARKS
303-1	U2-3-25	10			0.54542		285	142	.22/.04	279	93			
303-2		10			0.54542		285	142		285	97			CONTROLLER REPLACED,
303-3		10			0.54542		285	142		283	95			MAIN AIR LEAK REPAIRED
303-4		10			0.54542		285	142		280	98			
303-5			6	12	0.5		100	50		100	50			
TOTAL							1240	618		1227	433			
303-1	U2-3-26		6	48	2		150	75	.24/.03	136	74			BOX WILL NOT CONTROL IF
303-2			6	48	2		150	75		142	84			MIN. IS SET LOWER
303-3			6	48	2		150	75		141	76			
303-4			6	48	2		150	75		148	74			
303-5			6	48	2		150	75		134	74			
303-6			6	48	2		150	75		149	77			
TOTAL							900	450		850	459			
303-1	U2-3-27	10			0.54542		300	150	.40/.04	275	111			
303-2		10			0.54542		300	150		282	100			
303-3		10			0.54542		300	150		286	91			
303-4		10			0.54542		300	150		257	95			
303-5		10			0.54542		300	150		266	106			
303-6		10			0.54542		300	150		302	102			
303-7		10			0.54542		300	150		280	100			
303-8		10			0.54542		300	150		294	106			
303-9		10			0.54542		300	150		290	118			
303-10		10			0.54542		300	150		281	129			
303-11		10			0.54542		300	150		270	120			
303-12		10			0.54542		300	150		305	125			
TOTAL							3600	1800		3388	1303			

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-2

LOCATION: 3rd Floor VAV Boxes

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
	BOX						Cooling	Heating	Static Pressure	Cooling	Heating	Clg/Htg	AHU	
ROOM NUMBER	NUMBER	DIA	H	W	SQFT	Mult	Max	Max	Max/Min	Max	Max	Min	SP	REMARKS
303-1		10			0.54542		350	175		304	118			
303-2			6	48	2		150	75		138	54			
303-3			6	48	2		150	75		128	59			
303-4			6	48	2		150	75		130	58			
303-5	U2-3-28		6	48	2		150	75	.36/.04	156	61			
303-6			6	48	2		150	75		143	54			
303-7			6	48	2		150	75		147	53			
303-8		10			0.54542		350	175		328	131			
TOTAL							1600	800		1474	588			
303-1			6	48	2		150	75		152	76			BOX WILL NOT CONTROL IF
303-2							150	75		155	76			MIN. IS SET LOWER
303-3							150	75		145	78			
303-4	U2-3-29						150	75	xx/.03	164	78			
303-5							150	75		169	85			
303-6							150	75		156	89			
TOTAL							900	450		941	482			
303-1		10			0.54542		300	150		280	145			
303-2		10			0.54542		300	150		292	150			
303-3	U2-3-30	10			0.54542		300	150	.18/.03	286	153			
303-4		10			0.54542		300	150		299	155			
303-5		6			0.19635		100	50		106	58			
TOTAL							1300	650		1263	661			
303-1		8			0.34907		200	100		181	52			
303-2	U2-3-31	8			0.34907		230	115	xx/.02	235	73			FOUND BOX OUT OF CONTROL,
303-3		8			0.34907		302	150		236	74			NO HEAT,POSSIBLE BAD STAT.
TOTAL							732	365		652	199			OR REHEAT VALVE.
312-1		8			0.34907		225	112		204	34			
312-2	U2-3-32	8			0.34907		225	112	.40/.04	187	55			
TOTAL							450	224		391	89			

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-2

LOCATION: 3rd Floor VAV Boxes

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
							Cooling	Heating	Static Pressure	Cooling	Heating	Clg/Htg	AHU	
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Max	Max	Max/Min	Max	Max	Min	SP	REMARKS
310-1	U2-3-33	10			0.54542		315	158	xx/.03	311	135			
310-2		10			0.54542		315	158		315	133			
310-3		10			0.54542		315	158		274	114			
310-4		10			0.54542		315	158		312	132			
TOTAL							1260	632		1212	514			
310-1	U2-3-34		6	18	0.75		150	75	.26/.04	177	75			BOX WILL NOT CONTROL IF
310-2			6	18	0.75		150	75		157	73			MIN. SET ANY LOWER
310-3			6	18	0.75		150	75		153	70			
310-4			6	18	0.75		150	75		166	76			
310-5			6	18	0.75		150	75		158	77			
310-6			6	18	0.75		150	75		151	72			
TOTAL							900	450		962	443			
310-1	U2-3-35	10			0.54542		315	158	.22/.04	306	115			
310-2		10			0.54542		315	158		292	115			
310-3		10			0.54542		315	158		304	113			
310-4		10			0.54542		315	158		310	117			
310-5		10			0.54542		315	158		311	118			
310-6		10			0.54542		315	158		320	116			
310-7		10			0.54542		315	158		315	111			
310-8		10			0.54542		315	158		333	120			
TOTAL							2520	1264		2491	925			

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-2

LOCATION: 3rd Floor VAV Boxes

TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
							Cooling	Heating	Static Pressure	Cooling	Heating	Clg/Htg	AHU	
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Max	Max	Max/Min	Max	Max	Min	SP	REMARKS
310-1	U2-3-36	10			0.54542		350	175	.30/.04	348	149			
310-2			6	48	2		150	75		151	63			FOUND OUT OF CONTROL,
310-3			6	48	2		150	75		149	60			REPLACED CONTROLLER
310-4			6	48	2		150	75		150	82			
310-5			6	48	2		150	75		150	61			
310-6			6	48	2		150	75		150	65			
310-7			6	48	2		150	75		143	69			
310-8		10			0.54542		350	175		297	134			
310-9			6	48	2		150	75		147	77			
310-10			6	48	2		150	75		143	72			
310-11			6	48	2		150	75		141	66			
310-12			6	48	2		150	75		142	77			
TOTAL							2200	1100		2111	975			
310-1	U2-3-37	10			0.54542		315	158	.26/.04	315	115			
310-2		10			0.54542		315	158		326	110			
310-3		10			0.54542		315	158		332	107			
310-4		10			0.54542		315	158		302	109			
310-5		10			0.54542		315	158		318	110			
310-6		10			0.54542		375	180		375	130			
TOTAL							1950	970		1968	681			
309-1	U2-3-38	12			0.7854		430	215	.44/.05	363	113			
308-1	U2-3-39	8			0.34907		225	112	.40/.04	190	85			
308-2		8			0.34907		225	112		191	84			
TOTAL							450	224		381	169			
306-1	U2-3-40	8			0.34907		200	100	.30/.04	171	60			FOUND BOX OUT OF
306-2		8			0.34907		230	115		210	78			CONTROL, REPLACED
306-3		8			0.34907		230	115		208	80			CONTROLLER
TOTAL							660	330		589	218			

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)
AHU SYSTEM: AHU-2
LOCATION: 5th floor Mechanical Room
TEST DATE:
READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Cooling Max	Heating Max	Static Pressure Max/Min	Cooling Max	Heating Max	Clg/Htg Min	AHU SP	REMARKS
504 (CITES SERVER RM.)	U2-5-2	10			0.54542		500	0	.74/0					NO REHEAT
512-1	U2-5-3	8			0.34907		250	125	.43/.12	277	145	109		EXH. 352 CFM
506-2		10			0.54542		300	150		234	138	102		
505-3		8			0.34907		150	75		158	93	71		
TOTAL							700	350		669	376	282		
508-1	U2-5-4	8			0.34907		150	75	.26/.06	133	73			REPLACED CONTROLER
507-1 (ELEVATOR RM)			6	12	0.5		200	100		211	109			
TOTAL							350	175		344	182			98% MAX/ 80% MIN
512-1	U2-5-5	8			0.34907		150	75	.51/.08	144	90	62		106%MAX/97%MIN
512-2		8			0.34907		200	100		222	133	101		
512-3		8			0.34907		200	100		205	124	95		
512-4		8			0.34907		200	100		230	136	103		
512-5		8			0.34907		200	100		211	124	97		
512-6		8			0.34907		200	100		210	129	100		
TOTAL							1150	575		1222	736	558		
510-1	U2-5-6	8			0.34907		150	75	.93/.24	146	81	65		
510-2		8			0.34907		200	100		182	95	78		
510-3		8			0.34907		200	100		180	92	72		
TOTAL							550	275		508	268	215		92%max / 64% MIN
511 (MENS RM.)	U-2-5-7		17	10	1.18056		375	188	.40/.10	357	210	156		95%MAX/ 64%MIN (EXH 463)
502 (STORAGE)	U2-5-8	8			0.34907		200	100	.13/.03	216	121			108%MAX/121%MIN (R.A. 131)
403-1	U2-4-9	10			0.54542		285	142	.24/.06	286	110	110		98%MAX/97%MIN
403-2		10			0.54542		285	142		276	127	127		
STAIRS 1-3			6	12	0.5		100	50		103	65	64		
403-4		10			0.54542		285	142		257	145	15		
403-5		10			0.54542		285	142		295	138	138		
403-6			6	12	0.5		100	50		100	65	65		
TOTAL							1340	668		1317	650	519		

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)
AHU SYSTEM: AHU-2
LOCATION: 5th floor Mechanical Room
TEST DATE:
READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Cooling Max	Heating Max	Static Pressure Max/Min	Cooling Max	Heating Max	Clg/Htg Min	AHU SP	REMARKS
403-1	U2-4-10	10			0.54542		150	75	xx/.04	156	60			RESET MIN. S.P. TO .04
403-2		10			0.54542		150	75		147	58			
403-3		10			0.54542		150	75		162	60			
403-4		10			0.54542		150	75		154	57			
403-5		10			0.54542		150	75		146	61			
403-6		10			0.54542		150	75		160	55			
TOTAL							900	450		925	351			
403-1	U2-4-11	10			0.54542		300	150	.45/.04	273	94			BOX FOUND OUT OF CONTROL, WIDE OPEN. REPLACED CONTROLLER
403-2		10			0.54542		300	150		298	110			
403-3		10			0.54542		300	150			101			
403-4		10			0.54542		300	150			103			
403-5		10			0.54542		300	150			104			
403-6		10			0.54542		300	150			100			
403-7		10			0.54542		300	150			98			
403-8		10			0.54542		300	150			92			
403-9		10			0.54542		300	150			94			
403-10		10			0.54542		300	150			109			
403-11		10			0.54542		300	150			104			
403-12		10			0.54542		300	150						
TOTAL							3600	1800		571	1109			
403-1	U2-4-12	10			0.54542		350	175	.37/.04	362	141			
403-2		10			0.54542		150	75		153	62			
403-3		10			0.54542		150	75		146	59			
403-4		10			0.54542		150	75		151	65			
403-5		10			0.54542		150	75		145	75			
403-6		10			0.54542		150	75		141	59			
403-7		10			0.54542		150	75		163	72			
403-8		10			0.54542		350	175		331	129			
TOTAL							1600	800		1230	662			
403-1	U2-4-13		6	48	2		150	75	.27/.04	161	75			
403-2			6	48	2		150	75		143	62			
403-3			6	48	2		150	75		139	62			
403-4			6	48	2		150	75		142	60			
403-5			6	48	2		150	75		148	63			
403-6			6	48	2		150	75		162	64			
TOTAL							900	450		895	386			

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)
AHU SYSTEM: AHU-2
LOCATION: 5th floor Mechanical Room
TEST DATE:
READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Cooling Max	Heating Max	Static Pressure Max/Min	Cooling Max	Heating Max	Clg/Htg Min	AHU SP	REMARKS
403-1	U2-4-14	10			0.54542		300	150	.25/.04	301	113			THERMOSTAT LOCATED
STAIR-2-3			6	12	0.5		100	50		99	33			BEHIND BOOKS ON SHELF
403-3		10			0.54542		300	150		323	124			
403-4		10			0.54542		300	150		295	116			
403-5		10			0.54542		350	175		325	136			
403-6			6	12	0.5		100	50		85	30			
TOTAL							1450	725		1428	552			
403-1	U2-4-15		14	8	0.77778		200	100	.36/.03	198	65			
401-2		8			0.34907		230	115		247	85			
401-3		8			0.34907		230	115		259	87			
TOTAL							660	330		704	237			
412-1	U2-4-16	8			0.34907		225	112	.48/.03	205	61			
412-2		8			0.34907		225	112		230	60			
TOTAL							450	224		435	121			
410-1	U2-4-17	10			0.54542		315	157	.28/.04	302	139			
410-2		10			0.54542		315	157		317	136			
410-3		10			0.54542		375	187		369	164			
410-4		10			0.54542		315	157		311	133			
TOTAL							1320	658		1299	572			
410-1	U2-4-18		6	48	2		150	75	.27/.04	164	68			
410-2							150	75		150	65			
410-3							150	75		159	63			
410-4							150	75		157	63			
410-5							150	75		158	68			
410-6							150	75		149	60			
TOTAL							900	450		937	387			
410-1	U2-4-19	10			0.54542		315	158	.22/.03	294	102			
410-2		10			0.54542		315	158		310	108			
410-3		10			0.54542		315	158		315	117			
410-4		10			0.54542		315	158		311	109			
410-5		10			0.54542		315	158		309	107			
410-6		10			0.54542		315	158		304	97			
410-7		10			0.54542		315	158		305	103			
410-8		10			0.54542		315	158		315	104			
TOTAL							2520	1264		2463	847			

VAV AIR OUTLETS

PROJECT: Agricultural Consumer and Environmental Sciences (ACES)

AHU SYSTEM: AHU-2

LOCATION: 5th floor Mechanical Room

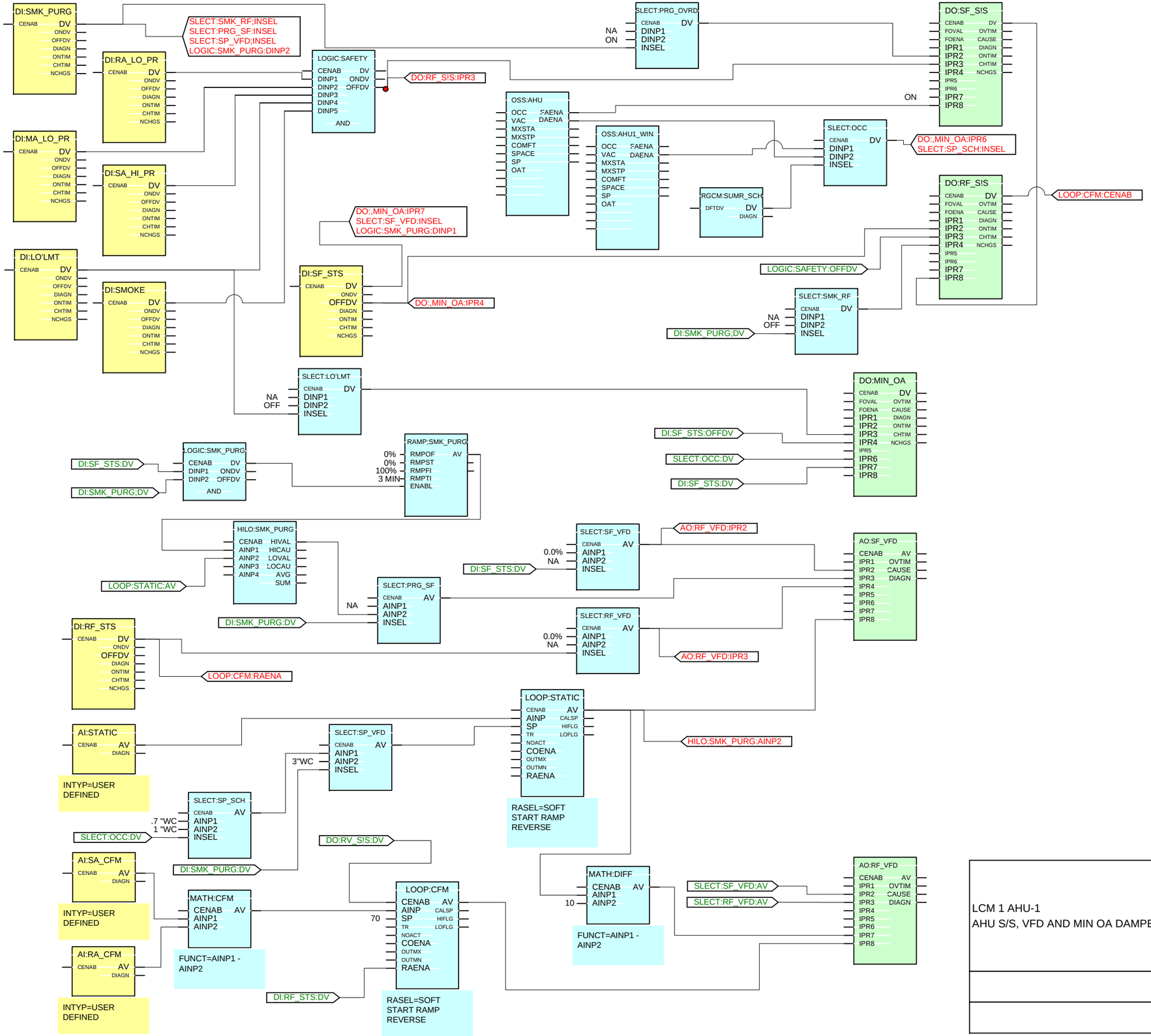
TEST DATE:

READINGS BY: JAMES HUGHES

AREA SERVED	OUTLET						DESIGN AIRFLOW (CFM)		PRELIMINARY	FINAL AIRFLOW (cfm)				
							Cooling	Heating	Static Pressure	Cooling		Clg/Htg	AHU	
ROOM NUMBER	BOX NUMBER	DIA	H	W	SQFT	Mult	Max	Max	Max/Min	Max	Heating Max	Min	SP	REMARKS
410-1	U2-4-20	10			0.54542		350	175	.29/.04	321	128			
410-2			6	48	2		150	75		145	72			
410-3			6	48	2		150	75		158	51			
410-4			6	48	2		150	75		150	56			
410-5			6	48	2		150	75		144	63			
410-6			6	48	2		150	75		157	60			
410-7			6	48	2		150	75		152	66			
410-8		10			0.54542		350	175		303	134			
410-9			6	48	2		150	75		156	60			
410-10			6	48	2		150	75		149	51			
410-11			6	48	2		150	75		142	60			
410-12			6	48	2		150	75		151	57			
TOTAL							2200	1100		2128	858			
410-1	U2-4-21	10			0.54542		315	158	.27/.03	308	120			
410-2		10			0.54542		315	158		315	125			
410-3		10			0.54542		315	158		325	124			
410-4		10			0.54542		315	158		330	126			
410-5		10			0.54542		315	158		347	127			
410-6		10			0.54542		375	187		357	137			
TOTAL							1950	977		1982	759			
409	U2-4-22	12			0.7854		430	215	.41/.04	405	147			
408-1	U2-4-23	8			0.34907		225	112	.64/.05	224	78			
408-2		8			0.34907		225	112		217	74			
TOTAL							450	224		441	152			
406-1	U2-4-24	8			0.34907		200	100	.34/.04	177	65			
406-2		8			0.34907		230	115		238	81			
406-3		8			0.34907		230	115		235	85			
TOTAL							660	330		650	231			

CONTROL DIAGRAMS & SEQ. 08

This section is dedicated to the control tradesmen who will need an understanding of the pneumatic and digital controls utilized in the building systems. Anything related to the sequence, logic block diagrams, alarms, sensors, and assigned points shall be contained herein. This building's controls does not allow for web graphics at this time. A future upgrade should include this option for remote monitoring and troubleshooting.



FAN SEQUENCE:

THE FAN IS NORMALLY COMMANDED ON AT ALL TIMES.

THE SMOKE PURGE DI WILL OVERRIDE ALL OTHER COMMANDS TO START THE FANS. THE SUPPLY FAN STATIC PRESSURE SETPOINT WILL BE RESET TO 3.0" WC AND THE DRIVE WILL RAMP UP TO 100% SPEED IN 3 MINUTES.

THE FREEZESTAT, RETURN AIR LOW PRESSURE SWITCH, MIXED AIR LOW PRESSURE SWITCH, SUPPLY AIR HIGH PRESSURE SWITCH OR SMOKE DETECTOR WILL CAUSE A SAFETY SHUT DOWN THE FANS.

SUPPLY FAN VFD OPERATION:

OCCUPIED MODE:
IN THE OCCUPIED MODE, IF SUPPLY AND RETURN FAN STATUS ARE PROVEN, THE SUPPLY FAN VFD WILL RUN AT THE OCCUPIED STATIC PRESSURE SETPOINT OF 1.0 “ WC.

UNOCCUPIED MODE:
IN THE UNOCCUPIED MODE, IF SUPPLY AND RETURN FAN STATUS ARE PROVEN, THE SUPPLY FAN VFD WILL RUN AT THE OCCUPIED STATIC PRESSURE SETPOINT OF 0.7 “ WC.

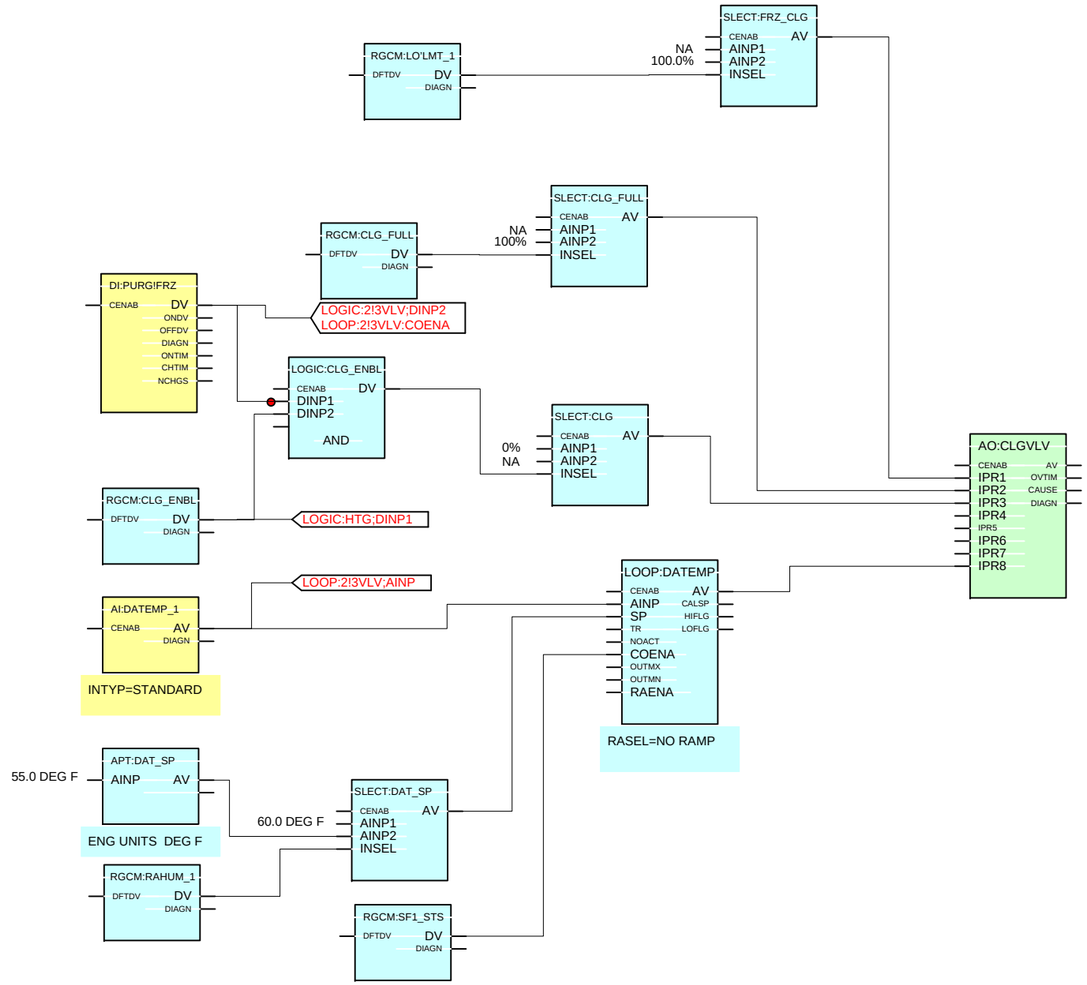
RETURN FAN VFD OPERATION:

IF SUPPLY AND RETURN FAN STATUS ARE PROVEN, THE RETURN FAN VFD WILL OPERATE AT 10% LESS SPEED COMMAND THAN THE SUPPLY FAN.

MINIMUM OUTSIDE AIR DAMPER OPERATION:

IF THE FREEZESTAT IS NOT TRIPPED, AND SUPPLY FAN STATUS IS PROVEN, AND THE UNIT IS IN THE OCCUPIED MODE, THE MINIMUM OUTSIDE AIR DAMPER WILL BE OPEN.

LCM 1 AHU-1 AHU S/S, VFD AND MIN OA DAMPER	ACES LIBRARY			
	AHU-1			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	7/10/2008	SHEET 1 OF 4	



CHILLED WATER VALVE OPERATION:

THE CHILLED WATER VALVE IS NORMALLY CLOSED. THE COMMAND IS % OPEN FOR THE VALVE.

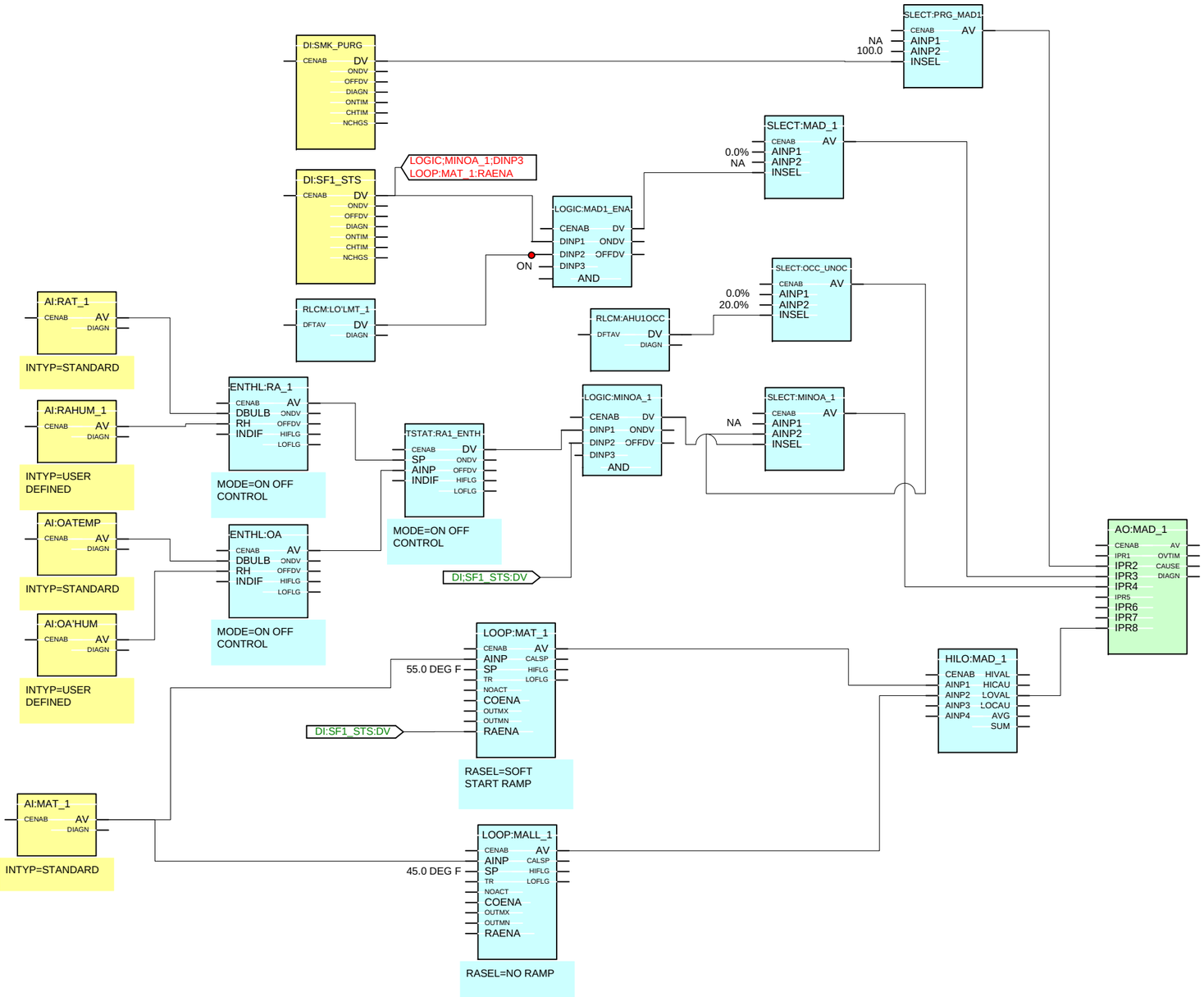
A TRIP OF THE FREEZESTAT WILL FORCE THE CHILLED WATER VALVE TO GO TO 100% OPEN UNTIL RESET.

IF THE COOLING FULL DPT COMMAND IS GIVEN, THE CHILLED WATER VALVE TO GO TO 100% OPEN UNTIL RESET.

IF COOLING IS NOT ENABLED (OUTSIDE AIR TEMPERATURE IS LESS THAN 45.5 DEG F) OR IF THE PURG/FRZ DI IS ENERGIZED, THE COOLING VALVE WILL BE COMMANDED TO 0% OPEN.

WHEN THE OUTSIDE AIR TEMPERATURE IS ABOVE 45.5 DEG F AND FAN STATUS IS PROVEN, THE FOLLOWING SEQUENCE WILL OCCUR:
WHEN THE RETURN AIR HUMIDITY IS ABOVE THE HIGH HUMIDITY SETPOINT (60% RH), THE DISCHARGE AIR SETPOINT WILL BE SET TO 55 DEG F, IF THE RETURN AIR HUMIDITY IS BELOW THE HIGH HUMIDITY SETPOINT, THE DISCHARGE AIR SETPOINT WILL BE SET TO 60 DEG F.

LCM 2 AHU-1 CHILLED WATER VALVE	ACES LIBRARY			
	AHU-1			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	6/18/2008	SHEET 2 OF 4	



MIXED AIR DAMPER OPERATION:

THE OUTSIDE AIR DAMPER, NORMALLY CLOSED, THE RETURN AIR DAMPER, NORMALLY OPEN, AND THE RELIEF AIR DAMPER, NORMALLY CLOSED ARE CONTROLLED BY THE SAME SIGNAL. THE SIGNAL CORRESPONDS TO THE POSITION OF THE OUTSIDE AIR DAMPER, OR % OPEN FOR THE OUTSIDE AIR DAMPER.

IF THE SMOKE PURGE DI IS ENERGIZED, THE MIXED AIR DAMPERS WILL BE COMMANDED TO 100%.

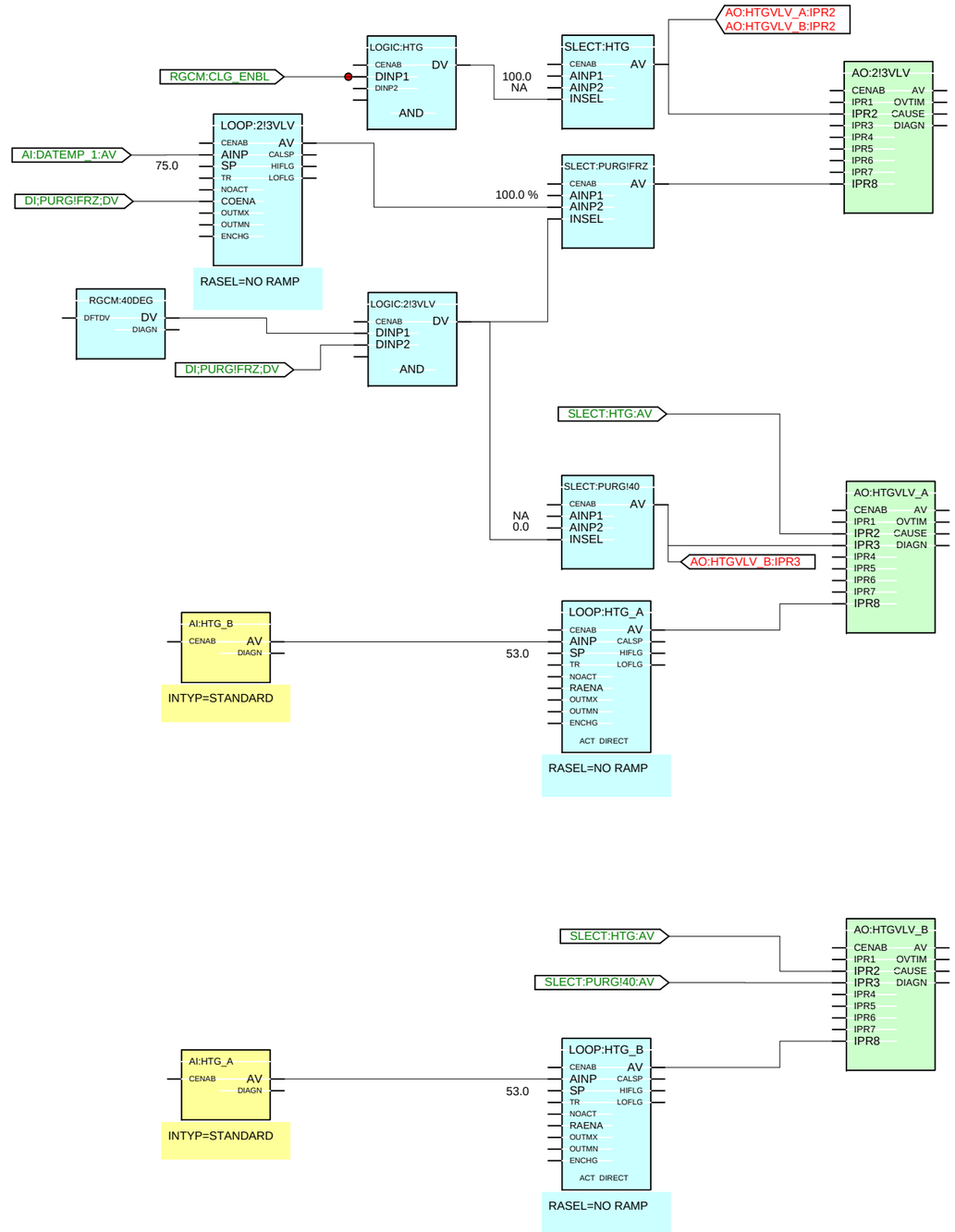
IF THERE IS NO FAN STATUS, OR IF THE FREEZESTAT IS TRIPPED, THE MIXED AIR DAMPERS WILL GO TO 0% COMMAND.

WHEN THE UNIT IS IN THE OCCUPIED MODE BASED ON THE WEEKLY SCHEDULE AND FAN STATUS IS PROVEN THE FOLLOWING WILL OCCUR:
(1) WHEN THE OUTSIDE AIR ENTHALPY IS GREATER THAN THE RETURN AIR ENTHALPY THE MIXED AIR DAMPER WILL BE COMMANDED TO ITS MINIMUM POSITION.
(2) WHEN THE OUTSIDE AIR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY, THE MIXED AIR DAMPER WILL MODULATE TO MAINTAIN 55 DEG F AT THE MIXED AIR SENSOR.

WHEN THE UNIT IS IN THE UNOCCUPIED MODE BASED ON THE WEEKLY SCHEDULE, THE ABOVE WILL OCCUR EXCEPT THE MINIMUM POSITION IS SET TO 0%.

AT NO TIME WILL THE MIXED AIR TEMPERATURE BE ALLOWED TO DROP BELOW 45 DEG F.

GCM AHU-1 MIXED AIR DAMPERS	ACES LIBRARY			
	AHU-1			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	7/11/2008	SHEET 3 OF 4	



PREHEAT VALVES OPERATION:

THE PREHEAT VALVES ARE NORMALLY OPEN. THE COMMAND IS % CLOSED FOR THE VALVES.

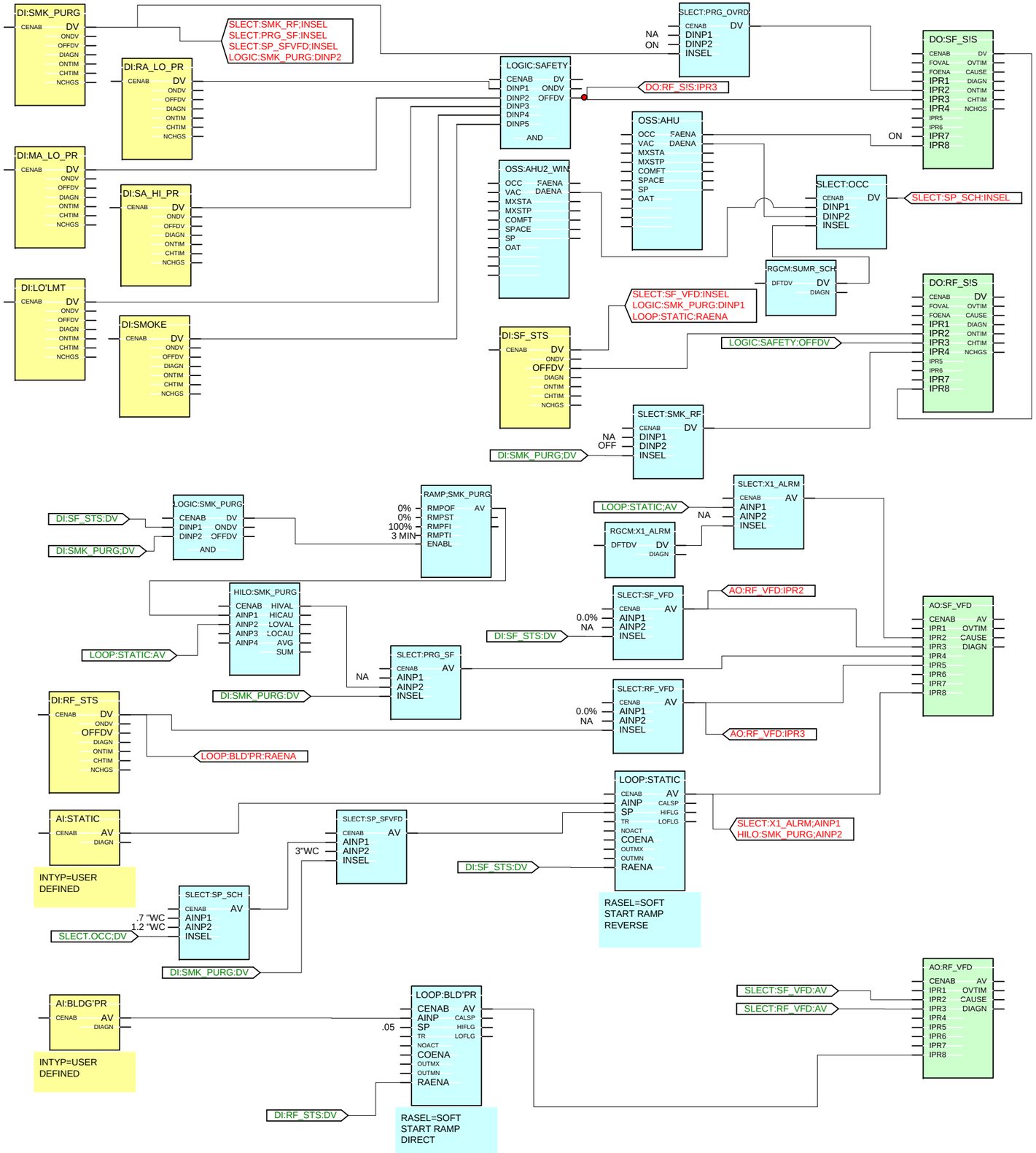
WHEN COOLING IS ENABLED THE VALVES WILL BE COMMANDED TO 100% CLOSED.

WHEN COOLING IS DISABLED (OUTSIDE AIR TEMPERATURE IS LESS THAN 45.5 DEG F) THE FOLLOWING WILL OCCUR:

IF THE PURG/FRZ DI IS ENERGIZED AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN 40 DEG F, PREHEAT VALVES A AND B WILL BE COMMANDED TO FULL OPEN AND THE 2/3 VALVE WILL BE MODULATED TO MAINTAIN A 74 DEG SETPOINT AT THE DISCHARGE AIR TEMPERATURE SENSOR.

IF THE PURG/FRZ DI IS NOT ENERGIZED OR THE OUTSIDE AIR TEMPERATURE IS ABOVE 40 DEG F, THE 2/3 VALVE WILL BE CLOSED AND PREHEAT VALVES A AND B WILL MODULATE TO MAINTAIN 53 DEG F AT THEIR PREHEAT DISCHARGE SENSOR LOCATIONS.

LCM 2 AHU-1 PREHEAT VALVES	ACES LIBRARY			
	AHU-1			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	6-18/2008	SHEET 4 OF 4	



FAN SEQUENCE:

SUPPLY FAN:

THE FAN IS NORMALLY COMMANDED ON AT ALL TIMES BUT CAN BE SCHEDULED.

THE SMOKE PURGE DI WILL OVERRIDE ALL OTHER COMMANDS TO START THE FAN.

THE FREEZESTAT, RETURN AIR LOW PRESSURE SWITCH, MIXED AIR LOW PRESSURE SWITCH, SUPPLY AIR HIGH PRESSURE SWITCH OR SMOKE DETECTOR WILL CAUSE A SAFETY SHUT DOWN OF THE FAN.

RETURN FAN:

THE FAN IS NORMALLY COMMANDED ON WITH THE SUPPLY FAN.

LOSS OF SUPPLY FAN STATUS WILL CAUSE THE RETURN FAN TO SHUT DOWN.

THE FREEZESTAT, RETURN AIR LOW PRESSURE SWITCH, MIXED AIR LOW PRESSURE SWITCH, SUPPLY AIR HIGH PRESSURE SWITCH OR SMOKE DETECTOR WILL CAUSE A SAFETY SHUT DOWN OF THE FAN.

THE SMOKE PURGE DI WILL CAUSE A SHUTDOWN OF THE RETURN FAN.

SUPPLY FAN VFD OPERATION:

A LOSS OF THE X1 ALARM SIGNAL WILL CAUSE THE DRIVE TO OPERATE TO MAINTAIN LOOP STATIC SETPOINT.

A LOSS OF FAN STATUS WILL CAUSE A ZERO COMMAND TO THE DRIVE.

ON A COMMAND FOR SMOKE PURGE WITH FAN STATUS PROVEN THE DRIVE WILL MAINTAIN DISCHARGE STATIC SETPOINT OF 3.0" WC UNTIL THE RAMP SIGNAL FROM THE 3 MINUTE RAMP HAS A HIGHER OUTPUT. THE OUTPUT WILL BE 100% AT THE END OF THE 3 MINUTE RAMP.

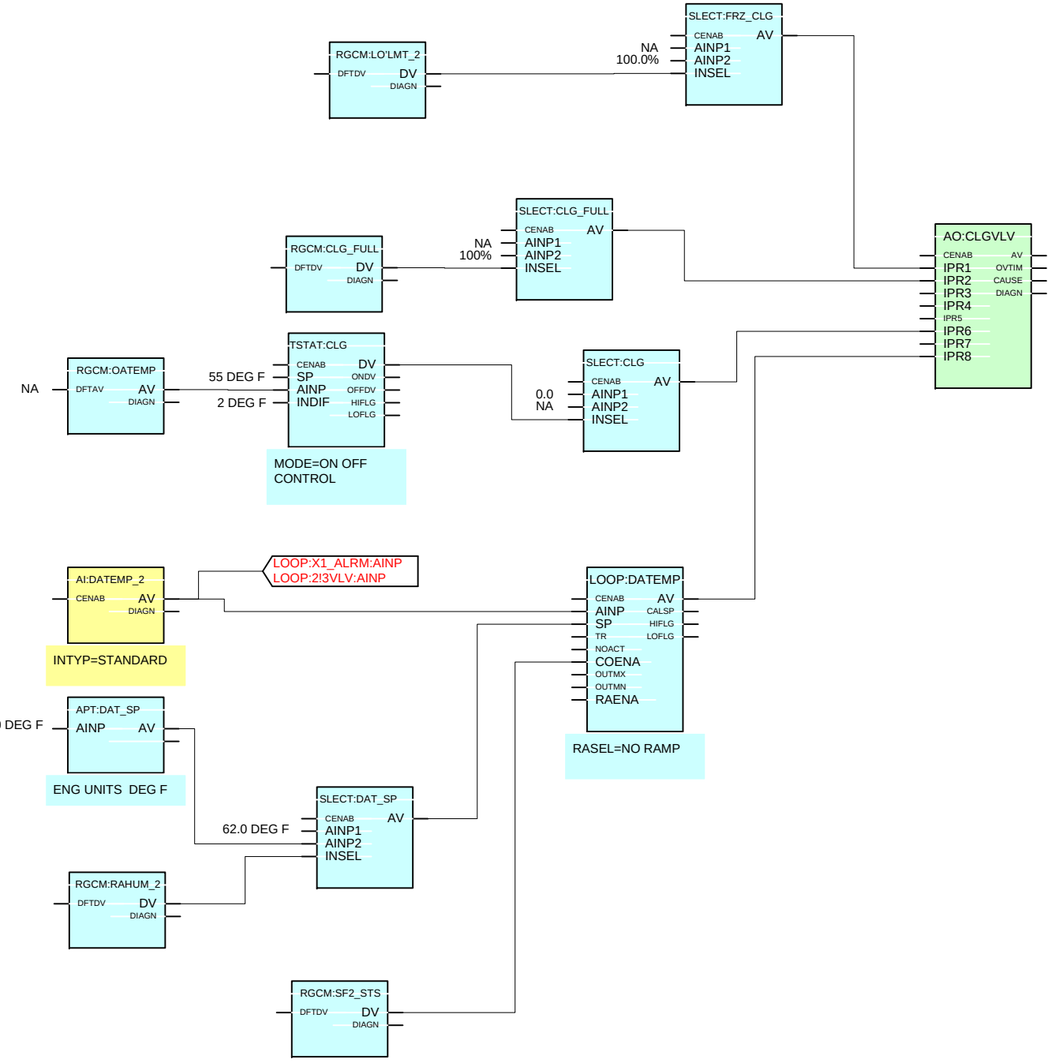
IF RETURN FAN STATUS IS NOT PROVEN, THE SUPPLY FAN WILL RECEIVE A 0% COMMAND.

IF NOTE OF THE ABOVE IS IN CONTROL, THE DRIVE WILL MAINTAIN A STATIC PRESSURE SETPOINT OF 1.2“ WC WHEN IN THE OCCUPIED MODE OR 0.7” WC WHEN IN THE UNOCCUPIED MODE.

RETURN FAN VFD OPERATION:

IF SUPPLY AND RETURN FAN STATUS ARE PROVEN, THE RETURN FAN VFD WILL OPERATE TO MAINTAIN A BUILDING PRESSURE SETPOINT OF 0.05" WC.

LCM 3 AHU-2 AHU S/S AND VFD	ACES LIBRARY			
	AHU-2			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	7/11/2008	SHEET 1 OF 4	



CHILLED WATER VALVE OPERATION:

THE CHILLED WATER VALVE IS NORMALLY CLOSED. THE COMMAND IS % OPEN FOR THE VALVE.

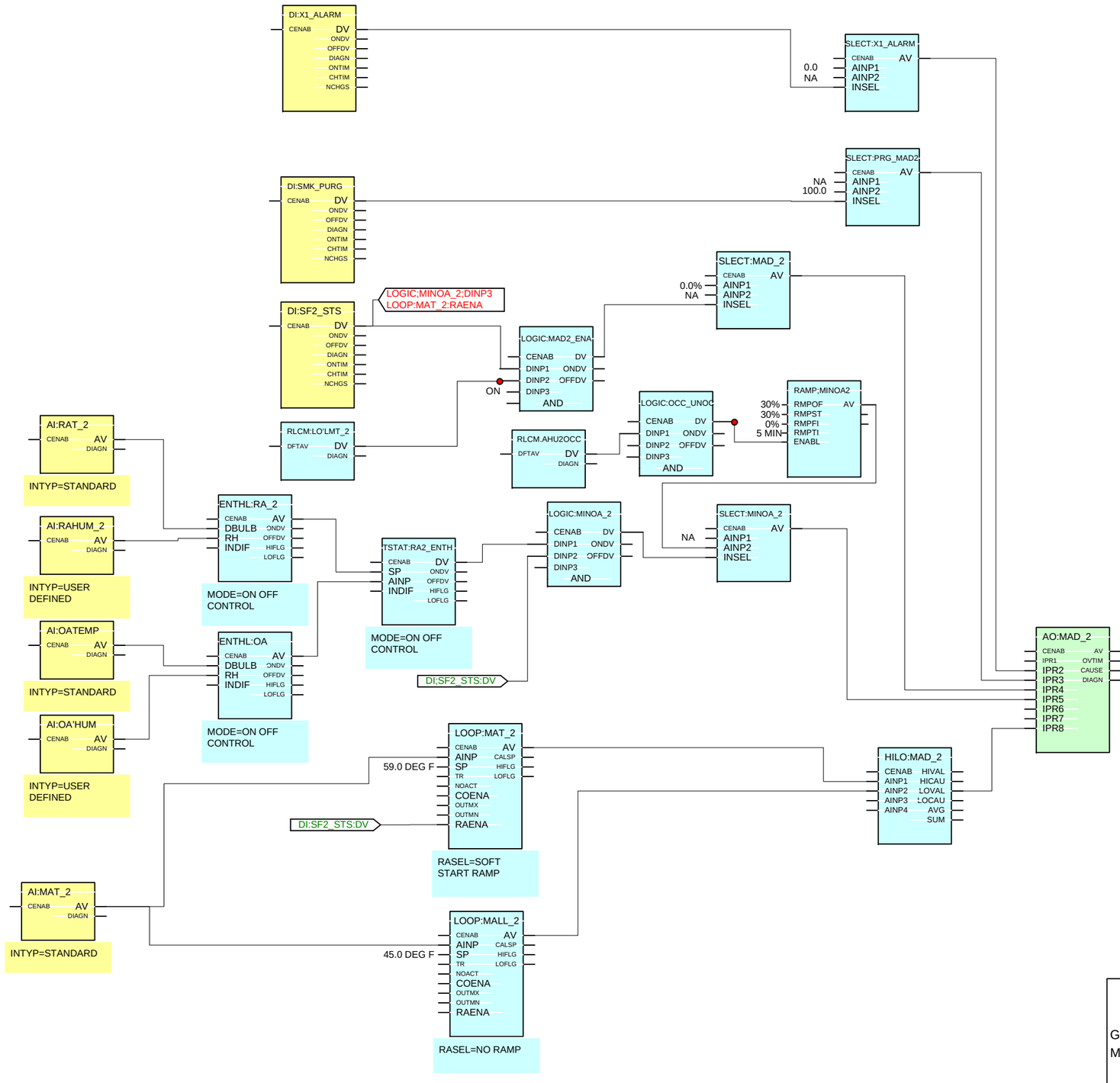
A TRIP OF THE FREEZESTAT WILL FORCE THE CHILLED WATER VALVE TO GO TO 100% OPEN UNTIL RESET.

IF THE COOLING FULL DPT COMMAND IS GIVEN, THE CHILLED WATER VALVE TO GO TO 100% OPEN UNTIL RESET.

IF OUTSIDE AIR TEMPERATURE IS LESS THAN 55.0 DEG F COOLING VALVE WILL BE COMMANDED TO 0% OPEN.

WHEN THE OUTSIDE AIR TEMPERATURE IS ABOVE 55.0 DEG F AND FAN STATUS IS PROVEN, THE FOLLOWING SEQUENCE WILL OCCUR:
WHEN THE RETURN AIR HUMIDITY IS ABOVE THE HIGH HUMIDITY SETPOINT (60% RH), THE DISCHARGE AIR SETPOINT WILL BE SET TO 55 DEG F, IF THE RETURN AIR HUMIDITY IS BELOW THE HIGH HUMIDITY SETPOINT, THE DISCHARGE AIR SETPOINT WILL BE SET TO 62.0 DEG F.

LCM 4 AHU-2 CHILLED WATER VALVE	ACES LIBRARY			
	AHU-2			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	7/7/2008	SHEET 2 OF 4	



MIXED AIR DAMPER OPERATION:

THE OUTSIDE AIR DAMPER, NORMALLY CLOSED, THE RETURN AIR DAMPER, NORMALLY OPEN, AND THE RELIEF AIR DAMPER, NORMALLY CLOSED ARE CONTROLLED BY THE SAME SIGNAL. THE SIGNAL CORRESPONDS TO THE POSITION OF THE OUTSIDE AIR DAMPER, OR % OPEN FOR THE OUTSIDE AIR DAMPER.

IF THE X1 ALARM SIGNAL IS LOST, THE DAMPERS WILL BE COMMANDED TO 0%.

IF THE SMOKE PURGE DI IS ENERGIZED, THE DAMPERS WILL BE COMMANDED TO 100%.

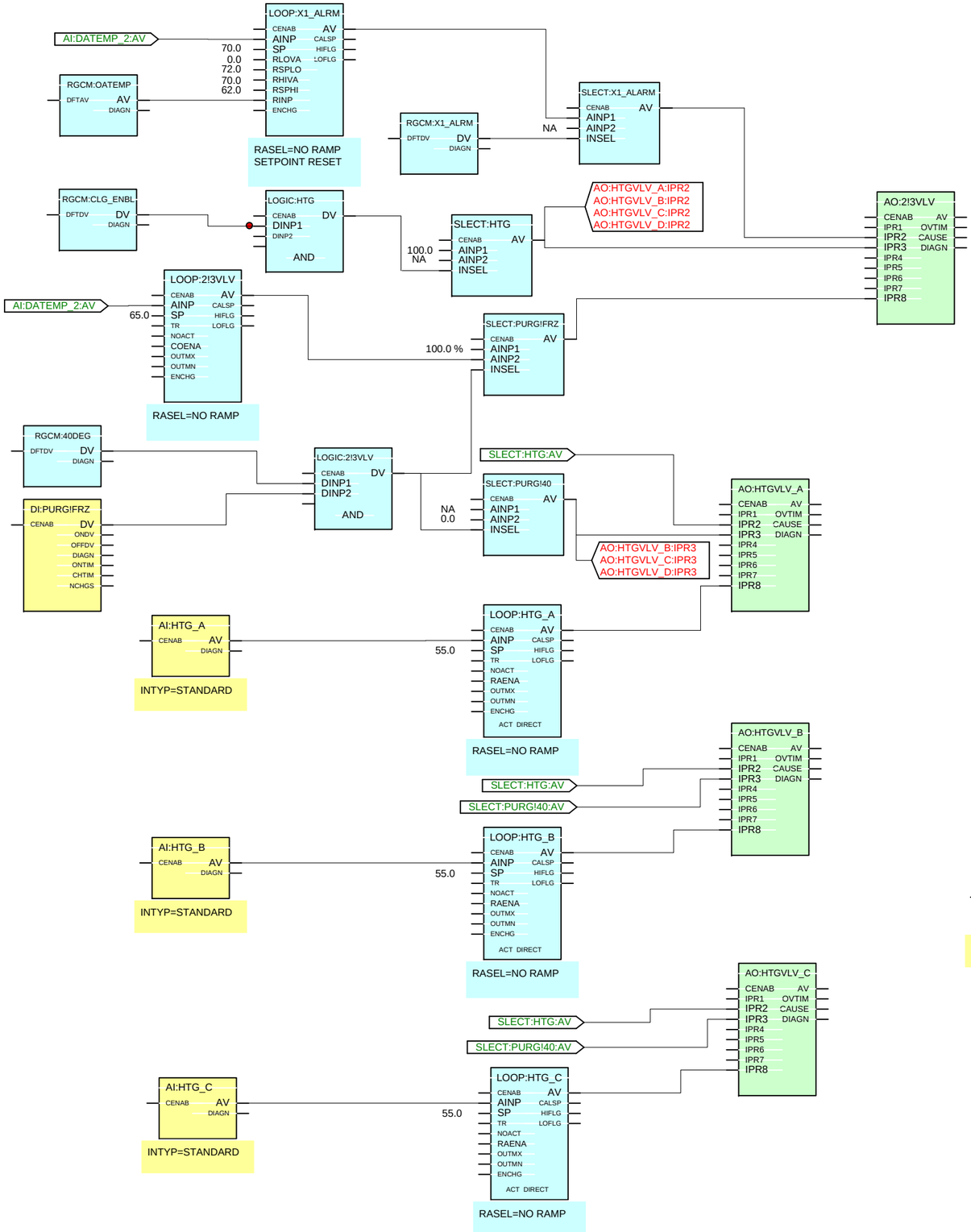
IF THERE IS NO SUPPLY FAN STATUS, OR IF THE FREEZESTAT IS TRIPPED, THE MIXED AIR DAMPERS WILL GO TO 0% COMMAND.

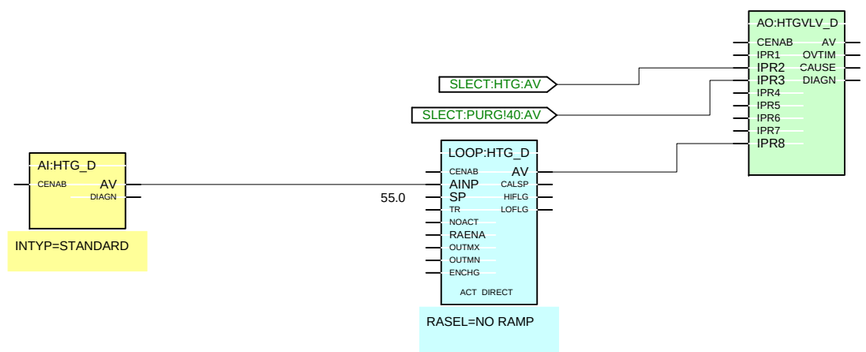
WHEN THE UNIT IS IN THE OCCUPIED MODE BASED ON THE WEEKLY SCHEDULE AND FAN STATUS IS PROVEN THE FOLLOWING WILL OCCUR:
(1) WHEN THE OUTSIDE AIR ENTHALPY IS GREATER THAN THE RETURN AIR ENTHALPY THE MIXED AIR DAMPER WILL BE COMMANDED TO ITS MINIMUM POSITION.
(2) WHEN THE OUTSIDE AIR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY, THE MIXED AIR DAMPER WILL MODULATE TO MAINTAIN 55 DEG F AT THE MIXED AIR SENSOR.

WHEN THE UNIT IS IN THE UNOCCUPIED MODE BASED ON THE WEEKLY SCHEDULE, THE ABOVE WILL OCCUR EXCEPT THE MINIMUM POSITION IS SET TO 0%.

AT NO TIME WILL THE MIXED AIR TEMPERATURE BE ALLOWED TO DROP BELOW 45 DEG F.

GCM AHU-2 MIXED AIR DAMPERS	ACES LIBRARY			
	AHU-2			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	7/11/2008	SHEET 3 OF 4	





PREHEAT VALVES OPERATION:

THE PREHEAT VALVES ARE NORMALLY OPEN. THE COMMAND IS % CLOSED FOR THE VALVES.

2/3 VALVE OPERATION:

WHEN THE X1 ALARM SIGNAL IS LOST, THE 2/3 VALVE WILL MODULATE TO MAINTAIN 72 DEG F AT THE DISCHARGE AIR TEMPERATURE SENSOR AT 0 DEG F OUTSIDE TEMPERATURE (OAT) AND 62 DEF F AT THE DISCHARGE AIR TEMPERATURE SENSOR AT 70 DEG F OAT.

WHEN COOLING IS ENABLED THE VALVES WILL BE COMMANDED TO 100% CLOSED.

IF THE PURG/FRZ DI IS ENERGIZED AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN 40 DEG F, THE 2/3 VALVE WILL BE MODULATED TO MAINTAIN A 65 DEG SETPOINT AT THE DISCHARGE AIR TEMPERATURE SENSOR.

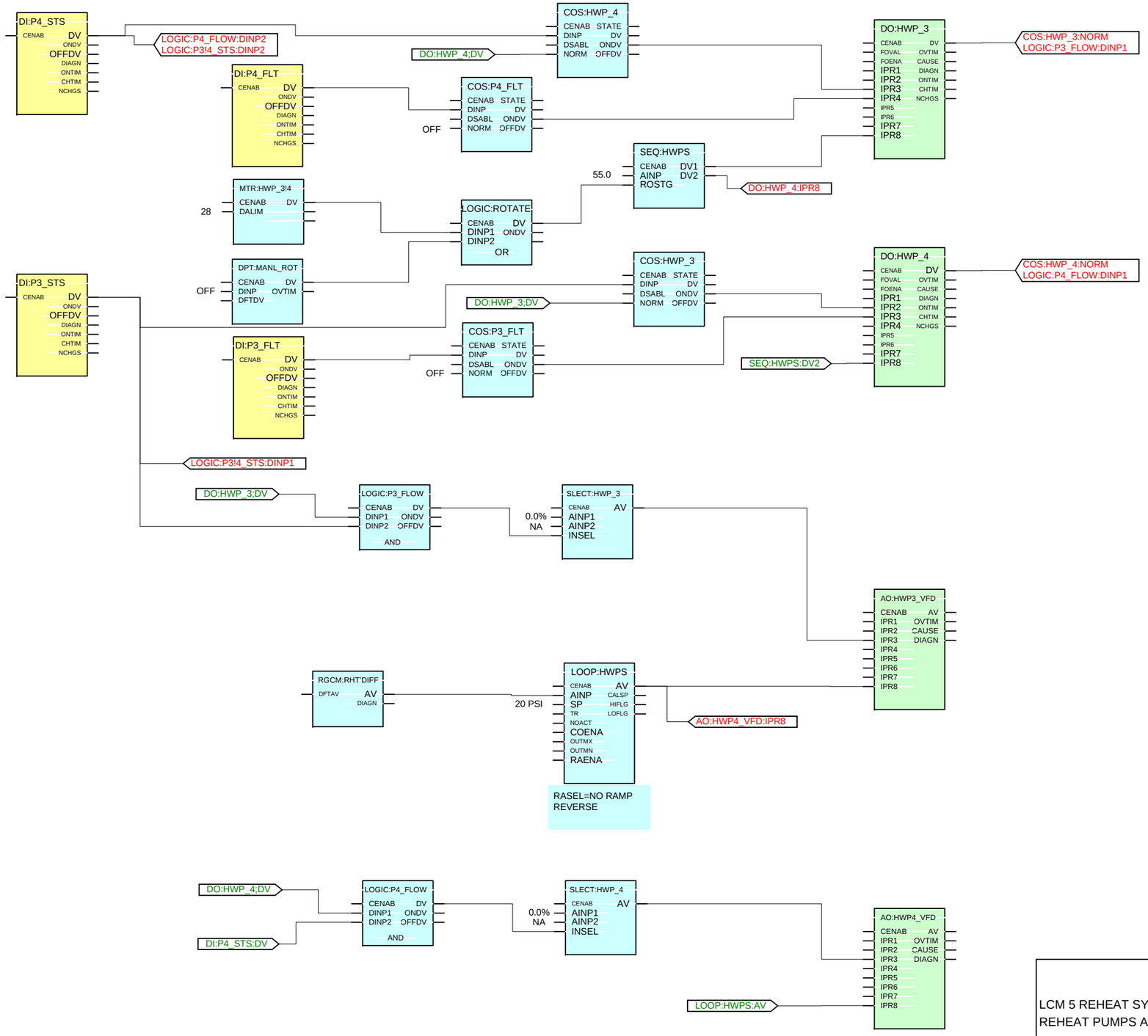
HEATING COIL VALVES A THRU D OPERATION:

WHEN COOLING IS DISABLED (OUTSIDE AIR TEMPERATURE IS LESS THAN 45.5 DEG F) THE FOLLOWING WILL OCCUR:

IF THE PURG/FRZ DI IS ENERGIZED AND THE OUTSIDE AIR TEMPERATURE IS LESS THAN 40 DEG F, PREHEAT VALVES A THRU D WILL BE COMMANDED TO FULL OPEN.

IF THE PURG/FRZ DI IS NOT ENERGIZED OR THE OUTSIDE AIR TEMPERATURE IS ABOVE 40 DEG F, PREHEAT VALVES A THRU D WILL MODULATE TO MAINTAIN 55 DEG F AT THEIR PREHEAT DISCHARGE SENSOR LOCATIONS.

LCM 4 AHU-2 PREHEAT VALVES	ACES LIBRARY			
	AHU-2			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	7/8/2008	SHEET 4 OF 4	



REHEAT PUMP SEQUENCE:

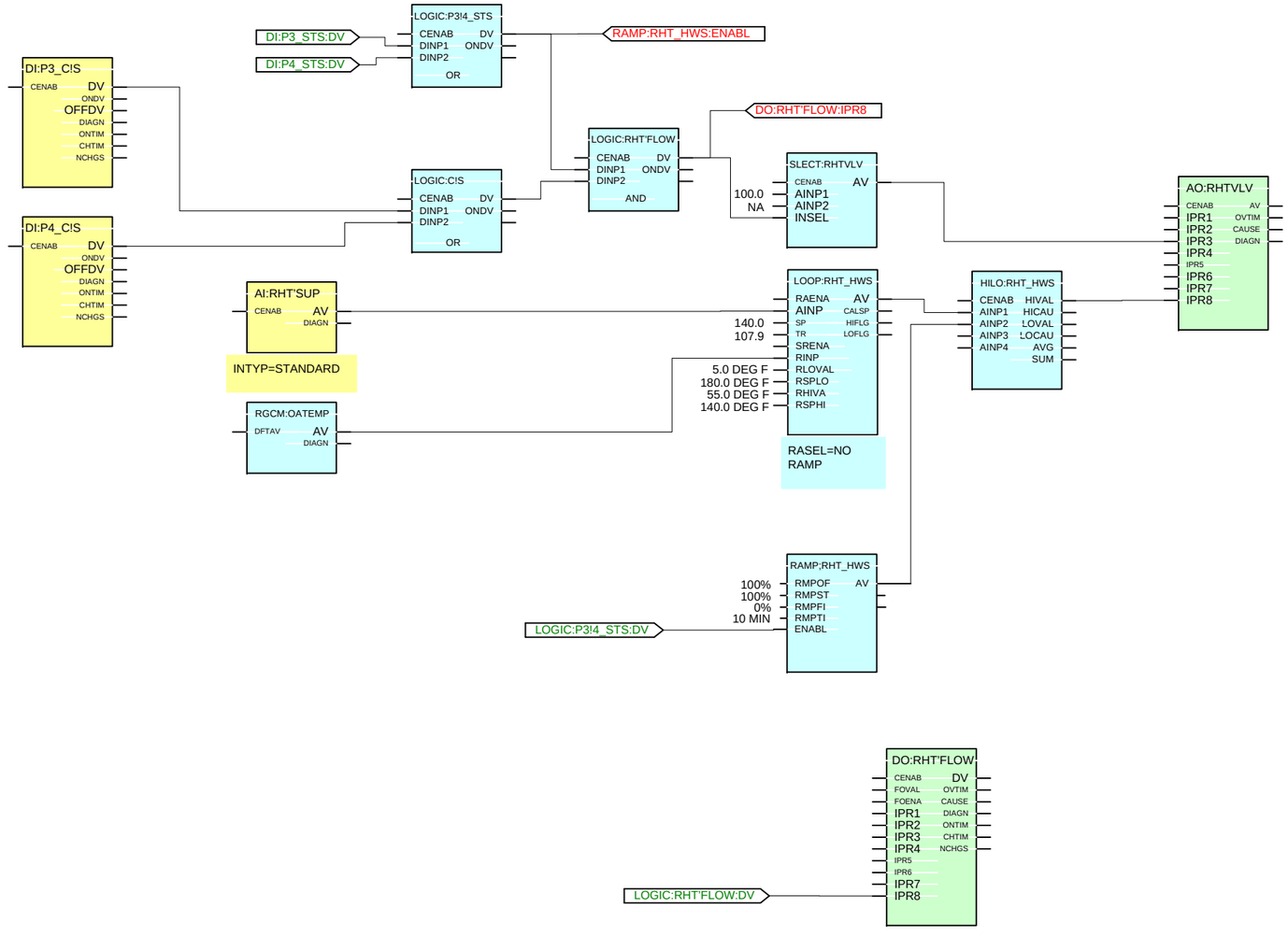
ONE PUMP IS COMMANDED ON AT ALL TIMES.

IF EITHER PUMP IS COMMANDED ON AND STATUS IS LOST, THE OTHER PUMP WILL BE COMMANDED ON. IF EITHER PUMP'S VFD SHOWS A FAULT, THE OTHER PUMP WILL BE COMMANDED ON. THE PUMPS WILL NORMALLY BE ROTATED EVERY 28 DAYS BY THE PROGRAM, OR THE ROTATION CAN BE DONE BY THE MANUAL ROTATION COMMAND.

REHEAT PUMP VFD OPERATION:

IF THE PUMP IS NOT COMMANDED ON, OR IF STATUS IS NOT PROVEN, THE VFD WILL RECEIVE A 0% COMMAND. IF THE PUMP IS COMMANDED ON AND STATUS IS PROVEN, THE VFD WILL MODULATE TO MAINTAIN A 20 PSI DIFFERENTIAL PRESSURE.

LCM 5 REHEAT SYSTEM REHEAT PUMPS AND VFDS	ACES LIBRARY			
	REHEAT SYSTEM			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	7/8/2008	SHEET 1 OF 4	



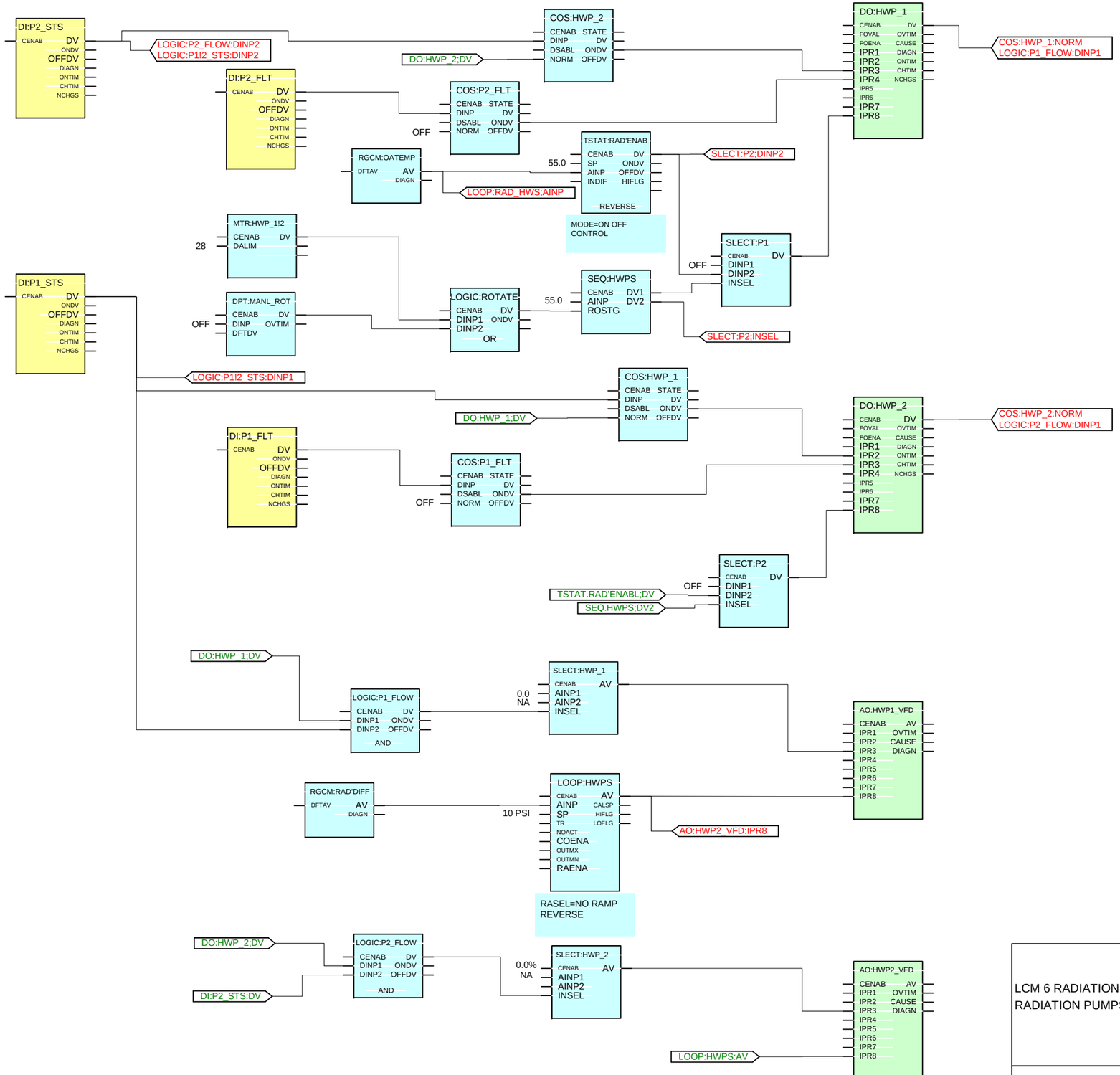
REHEAT STEAM VALVE OPERATION:

THE STEAM VALVE IS A NORMALLY OPEN VALVE. COMMAND IS % CLOSED.

IF PUMP STATUS IS NOT PROVEN, THE VALVE WILL BE COMMANDED TO 100% CLOSED AND THE REHEAT VALVE EP WILL BE COMMANDED TO PLACE MAIN AIR ON THE VALVE ACTUATOR TO CLOSE THE VALVE.

IF PUMP STATUS IS PROVEN, THE HEAT EXCHANGER VALVE WILL BE RAMPED OPEN AND THEN MAINTAIN A SUPPLY WATER SETPOINT BASED ON OUTSIDE AIR TEMPERATURE (OAT). IF OAT IS 5 DEG F, THE SUPPLY SETPOINT IS 180 DEG F, IF OAT IS 55 DEG F OR GREATER, THE SUPPLY SETPOINT IS 140 DEG F.

LCM 5 REHEAT SYSTEM STEAM VALVE	ACES LIBRARY			
	REHEAT SYSTEM			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	7/8/2008	SHEET 2 OF 4	



RADIATION PUMP SEQUENCE:

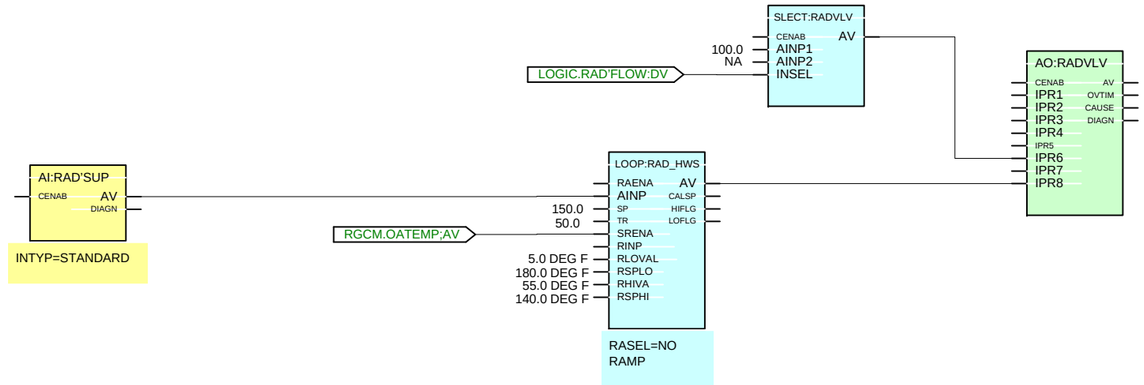
ONE PUMP IS COMMANDED ON WHENEVER OUTSIDE AIR TEMPERATURE IS ABOVE 55 DEG F.

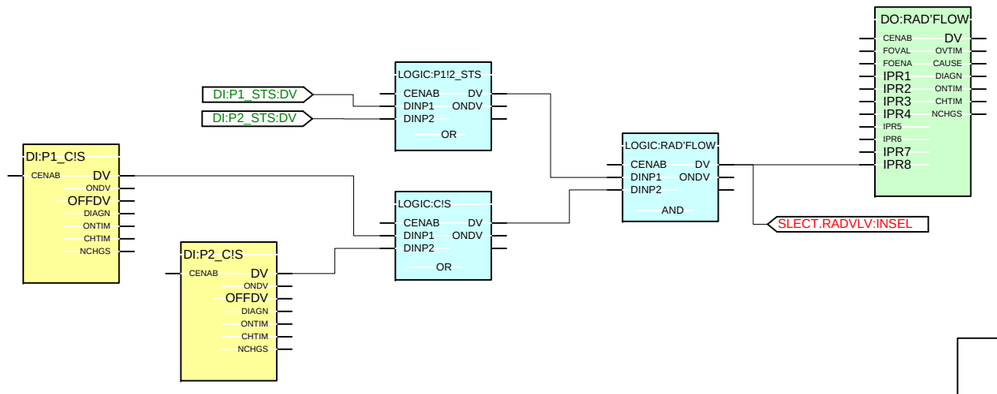
IF EITHER PUMP IS COMMANDED ON AND STATUS IS LOST, THE OTHER PUMP WILL BE COMMANDED ON. IF EITHER PUMP'S VFD SHOWS A FAULT, THE OTHER PUMP WILL BE COMMANDED ON. THE PUMPS WILL NORMALLY BE ROTATED EVERY 28 DAYS BY THE PROGRAM, OR THE ROTATION CAN BE DONE BY THE MANUAL ROTATION COMMAND.

RADIATION PUMP VFD OPERATION:

IF THE PUMP IS NOT COMMANDED ON, OR IF STATUS IS NOT PROVEN, THE VFD WILL RECEIVE A 0% COMMAND. IF THE PUMP IS COMMANDED ON AND STATUS IS PROVEN, THE VFD WILL MODULATE TO MAINTAIN A 10 PSI DIFFERENTIAL PRESSURE.

LCM 6 RADIATION SYSTEM RADIATION PUMPS AND VFDS	ACES LIBRARY			
	RADIATION SYSTEM			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	7/8/2008	SHEET 3 OF 4	





RADIATION STEAM VALVE OPERATION:

THE STEAM VALVE IS A NORMALLY OPEN VALVE. COMMAND IS % CLOSED.

IF PUMP STATUS IS NOT PROVEN, THE VALVE WILL BE COMMANDED TO 100% CLOSED AND THE REHEAT VALVE EP WILL BE COMMANDED TO PLACE MAIN AIR ON THE VALVE ACTUATOR TO CLOSE THE VALVE.

IF PUMP STATUS IS PROVEN, THE HEAT EXCHANGER VALVE WILL MODULATE TO MAINTAIN A SUPPLY WATER SETPOINT BASED ON OUTSIDE AIR TEMPERATURE (OAT). IF OAT IS 5 DEG F, THE SUPPLY SETPOINT IS 180 DEG F, IF OAT IS 55 DEG F OR GREATER, THE SUPPLY SETPOINT IS 140 DEG F.

LCM 6 RADIATION SYSTEM STEAM VALVE	ACES LIBRARY			
	RADIATION SYSTEM			
	SIZE	FSCM NO	DWG NO	REV
	SCALE NONE	7/8/2008	SHEET 4 OF 4	

ELECTRICAL & ASSOCIATED TRADES 09

This section is dedicated to the electrical, fire alarm, telephone, data & cable tradesmen and associated engineers. It is here for any data related to the functioning, replacement, and energy consumption by the aforementioned systems in the building.

ACES Lib. Electrical System Walk Thru 9/6/01

Elective Foreman Randy Fisher

Fed from DC-6

Lower level new Load Center LC 62
feeds Mech, AST, ACES, Fire station, Garage, AHU+LAR

2 unit subs SE corner lower level | TR-1 | TR-2 | Circuit Breakers

TR-1 12,470 → 277/480 motors, etc

TR-2 → 120-208 Receptacles

500 Kw gen 277-480
Auto transfer sw in room next to sw. gear
feeds fire pump sewage ej smoke ejection Emer power

Lighting 277v all fluorescent

Low voltage relays. master station → circ desk
controls lights + receptacles in core area

dimming system in basement (Multi media room.)

Security system card access perimeter + basement (Computer area)

P.A. system 2nd level circ desk (rack)
F.A. system addressable
Voice + data system cable tray. per CCSO

7/4-8/69

Motorized blinds. remote (some)
manual (some)
east side not motorized
TT sws above ceiling.

Separate panel for site lighting

Core risers
power - West
comm - East

2nd floor circulation desk - check-in area
Alarm gates.

Cold cathode tide fixture in Atrium

Swgear Rooms 011 - 016
Clock system - remote low voltage system Room

120v power panels surge protected
Red - recepts EM

Walk thru ACES Library 9/6/01

Electrical Service to the Building

1. The building has two unit substations TR1 at 12.47 KV to 277/480 V 3-phase 4W. and TR2 at 12.47 KV to 120/208 V 3-phase 4W. both served from new load center #62 via DC6. The distribution switchboards associated with the unit substations are circuit breaker type.

2. The building has a 500 KW277/480 V 3-phase 4W diesel generator with skid mounted fuel tank and an automatic transfer switch.
   a. Fire Pump
   b. Smoke Exac.
   c. Elevators
   d. Sewage Ejector
   e. Make Up Air to Exhaust System — LIFE SAFETY

3. Lighting: The majority of lighting in the building is 277 volt. The lighting and selected receptacles in open areas are controlled by low voltage relays. Master control at circulation desk second level.

4. The Multimedia Room in the lower level has a Grafix Eye dimming system.

5. Security and Door Access System
   a. A perimeter security system is provided with card access and electric locks. Selective rooms in the lower level are provided with card access and electric locks.

6. The building has a public address sound system with selective [redacted]-zones with phone access. SOUND SYSTEM RACK @ CIR. DESK.

7. The building has an addressable fire alarm system with smoke and heat detectors, magnetic door holders, sprinkler connections, elevation recalls, horn and strobe alarms. The fire alarm is also tied into the campus loop.

8. The building is provided with voice and data communications all in accordance with University standards.

ACES Library HVAC + Controls Walk-Thru

9/7/01

2 AHUs Variable velocity

Unit in Basement — serves Basement + 1st floor
Unit on 5th — 2 thru 5
perimeter hot water
Preheat + chill water coils in AHUs

Smoke evac. sys in atrium
2 exh fans on 5th floor start after 2 or 3 mins.
Supply to full speed first + dampers prove first.

6 things to start smoke exh fans

↓

Six sets of damper
11 switches in series

2 rad pumps main + back-up Temp varies°
2 reheat pumps Temp. 180°
2 chw pumps

2 heat exchangers
rad + reheat 2 separate systems

Pumps rotate every 28 days

GCS in elect vault for a few alarms

2 B+G pumps in basmt ME Room
(1 is backup)

in room by itself

2 restroom fans + general exh. ← B+5 → in ME room overhead

2 Rectangle rings around atrium are intakes for smoke fans

QUANTA *Elite*

USER GUIDE

Version 1J
9/20/00

INTELLIGENT LIGHTING CONTROLS, INC.

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Minneapolis. Minnesota 55439
Phone 952 829 1900
FAX 952 829 1901
1-800-922-8004

Overview

The QUANTA Elite is a microprocessor-based programmable lighting controller. You can program each of the controller inputs to control any or all of the relay outputs. The QUANTA Elite is UL and FCC approved for commercial and residential applications.

Structure

The major components making up the controller are:

- enclosure
- control transformer
- CPU I/O board
- additional I/O boards
- programming module
- lighting relays

Enclosure – The enclosure is rated NEMA 1. It is divided into a line voltage section containing the line voltage side of the control transformer and lighting relays and a low voltage section containing the Class 2 side of the lighting relays, transformer secondaries and electronic components. Enclosures are available in 6 sizes to accommodate 8, 16, 24, 32, 40 and 48 inputs, outputs, and lighting relays. The QUANTA Elite is shipped to the job-site as a complete assembly.

Transformer – A 40 VA multi-tap control transformer (120 or 277/24 VAC) provides the 24 VAC input to power the controller electronics.

CPU I/O Board – The CPU board provides the controller's intelligence and memory and the first eight (8) of the controller inputs and outputs. Major components include:

- *Power Supply* – converts the 24 VAC input to the +5, -5 and +12 VDC required by the controller logic and communications circuits. A power switch provides the means of energizing/de-energizing all controller electronics.
- *Micro-Processor* – executes the computer code and coordinates all controller functions including the controller real time clock.
- *PROM Chip* – contains the controller operating system and basic tasks.
- the *EEPROM Chips* – store the user-entered operating parameters.
- *"Super Cap"* – keeps the controller real-time clock functioning during power failures.
- *Switch Inputs* – can accept input from either 2- or 3-wire momentary or maintained dry contact devices. Each input has two associated LEDs (light emitting diodes). The ON LED lights when a closure is sensed between the ON and COMMON terminals. The OFF LED lights when a closure is sensed between the OFF and COMMON terminals. The inputs are noise- and surge-resistant. A switch may be located up to 1500 feet from the controller, provided you use a minimum of 18 gauge wire.
- *Relay Outputs* – Each output switches its associated lighting relay ON and OFF. Each output has an associated LED. The LED lights when the output switches the relay ON.
- *Override Switches* – Each relay output is equipped with an ON and an OFF override switch. These switches allow you to turn the associated lighting relay ON or OFF.
- *Stagger Start* - The controller switches those relays impacted by the same switch signal ON/OFF, one at a time.

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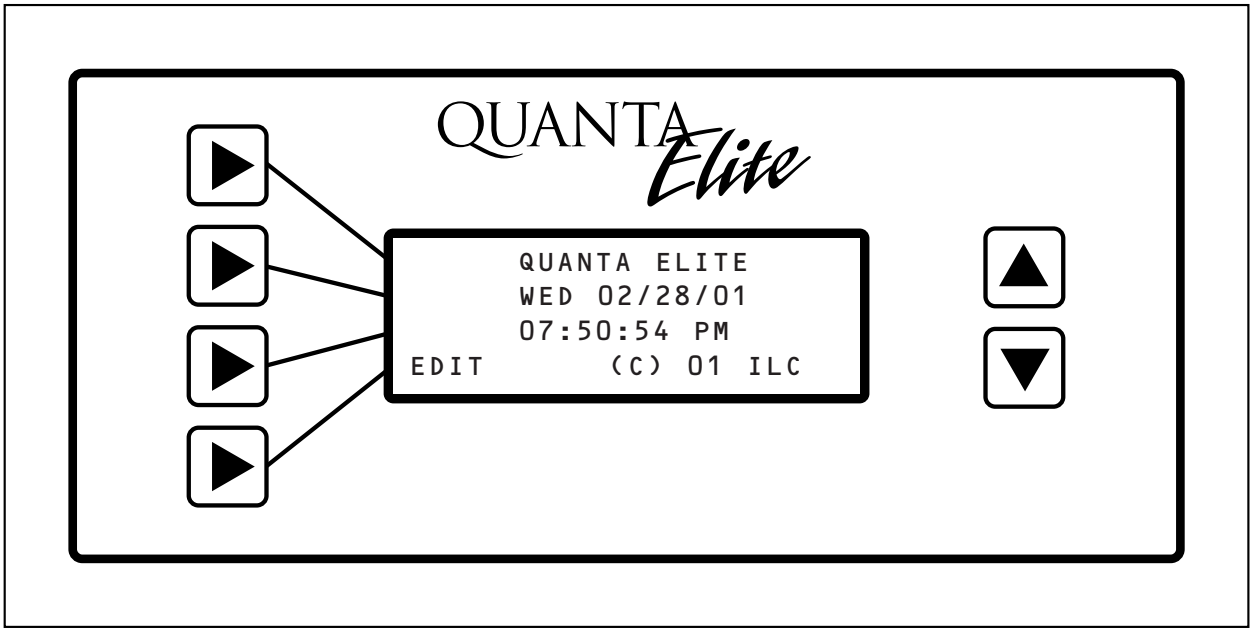
Controller Description



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Objectives

In this Section you will learn about the structure and configuration of the QUANTA Elite Controller.

Overview

The QUANTA Elite is a microprocessor-based lighting controller. You can program the QUANTA Elite to control lighting relays in response to switch signals sensed by its inputs and/or by time-based scheduling. The QUANTA Elite is UL approved and FCC certified for both commercial and residential applications.

1.1 Controller Architecture

The major components making up the controller are: (See Figure 1.1.)

- enclosure
- control transformer
- CPU I/O board
- additional I/O boards
- programming module
- lighting relays

1.1.1 Enclosure – The enclosure is rated NEMA 1. It is divided into a line voltage section containing the line voltage side of the control transformer and lighting relays and a low voltage section containing the Class 2 side of the lighting relays, transformer secondary, and electronic components. Enclosures are available in 6 sizes to accommodate 8, 16, 24, 32, 40 and 48 inputs, outputs, and lighting relays. (See Table 1-1.) The QUANTA Elite is shipped to the job-site as a complete assembly. (See Figure 1-1 which illustrates QUANTA Elite 8.)

1.1.2 Transformer – A 40 VA multi-tap control transformer (120 or 277/24 VAC) provides the 24 VAC input to power the controller electronics.

1.1.3 CPU I/O Board – (See Figure 1.2.) The CPU board provides the controller's intelligence and memory and the first eight (8) of the controller inputs and outputs. Major components include:

- *Power supply* – converts the 24 VAC input to the +5, -5 and +12 VDC required by the controller logic and communications circuits. A power switch provides the means of energizing/de-energizing all controller electronics.
- *Micro-Processor* – executes the computer code and coordinates all controller functions, including the controller real-time clock.
- *PROM Chip* – contains the controller operating system and basic tasks.
- *EEPROM Chips* – store the user-entered operating parameters.
- *"Super Cap"* – keeps the controller real-time clock functioning during power failures.
- *Switch Inputs* - can accept input from either 2- or 3-wire momentary or maintained dry contact devices. Each input has two associated LEDs. The ON LED lights when a closure is sensed on the ON and COMMON terminals. The OFF LED lights when a closure is sensed on the OFF and COMMON terminals. The inputs are noise- and surge-resistant. A switch may be located up to 1500 feet from the controller, provided a minimum of 18 gauge wire is used.
- *Relay Outputs* - Each output switches its associated lighting relay ON and OFF. Each output has an associated LED (light emitting diode). The LED lights when the output switches the relay ON.
- *Override Switches* - Each relay output is equipped with an ON and an OFF override switch. These switches allow you to turn the associated lighting relay ON or OFF.

1.1.4 Additional I/O Board(s) – Additional I/O boards composed of 8 inputs and 8 outputs can be added to the appropriate size enclosure to expand the controller capacity up to 48 switch inputs and 48 switch relay outputs. (See Figure 1.3, which illustrates a QUANTA Elite 32.)

1.1.5 Programming Module – (See Figure 1.4.) The programming module provides you with access to program and view controller data. It consists of a tactile response keypad and screen. The programming module is either mounted to the CPU I/O board or at your option can be a separate hand-held portable device that you can temporarily connect during programming and then detach.

1.1.6 Lighting Relays – control the line voltage loads. The lighting relays can control 120 or 277 VAC loads rated up to 20 amps. The Class 2 low voltage control part of each relay is terminated to a relay output on the controller CPU I/O board. (See Figure 1.2.) Each relay output controls only one lighting relay.

1.2 Controller Capacity

Unless you have ordered optional communications/expansion features, each QUANTA Elite can control up to 48 programmable switched inputs and 48 relay outputs.

Model	# of Relays & I/O Points	Width	Height	Depth
Elite 8	8	18 inches	15 inches	4 inches
Elite 16	16	24 inches	18 inches	4 inches
Elite 24	24	24 inches	36 inches	4 inches
Elite 32	32	24 inches	36 inches	4 inches
Elite 40	40	24 inches	48 inches	6 inches
Elite 48	48	24 inches	48 inches	6 inches

Table 1.1 – QUANTA Elite Configurations

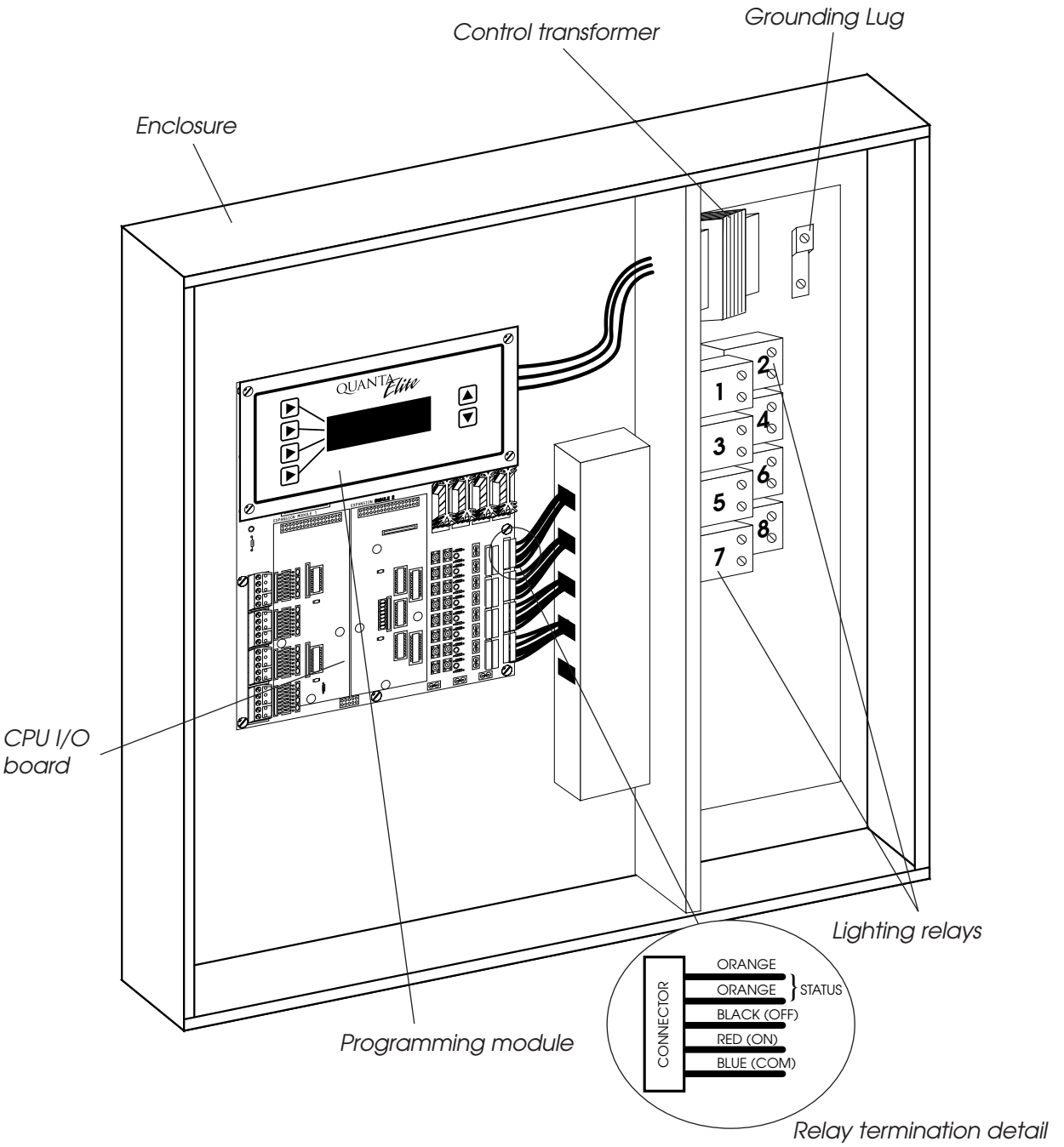


Figure 1.1 – QUANTA Elite 8 Controller

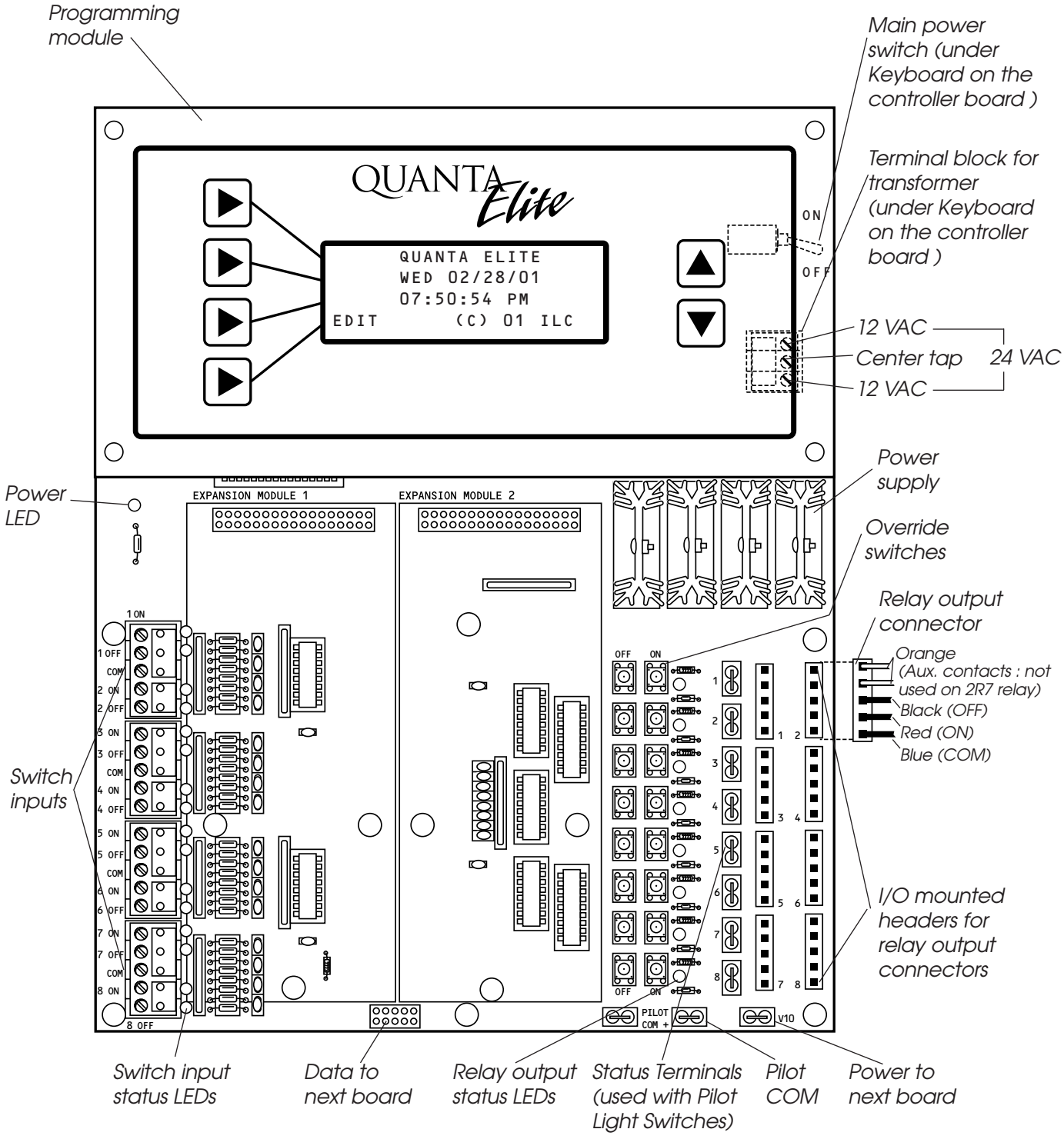


Figure 1.2 – CPU I/O Board

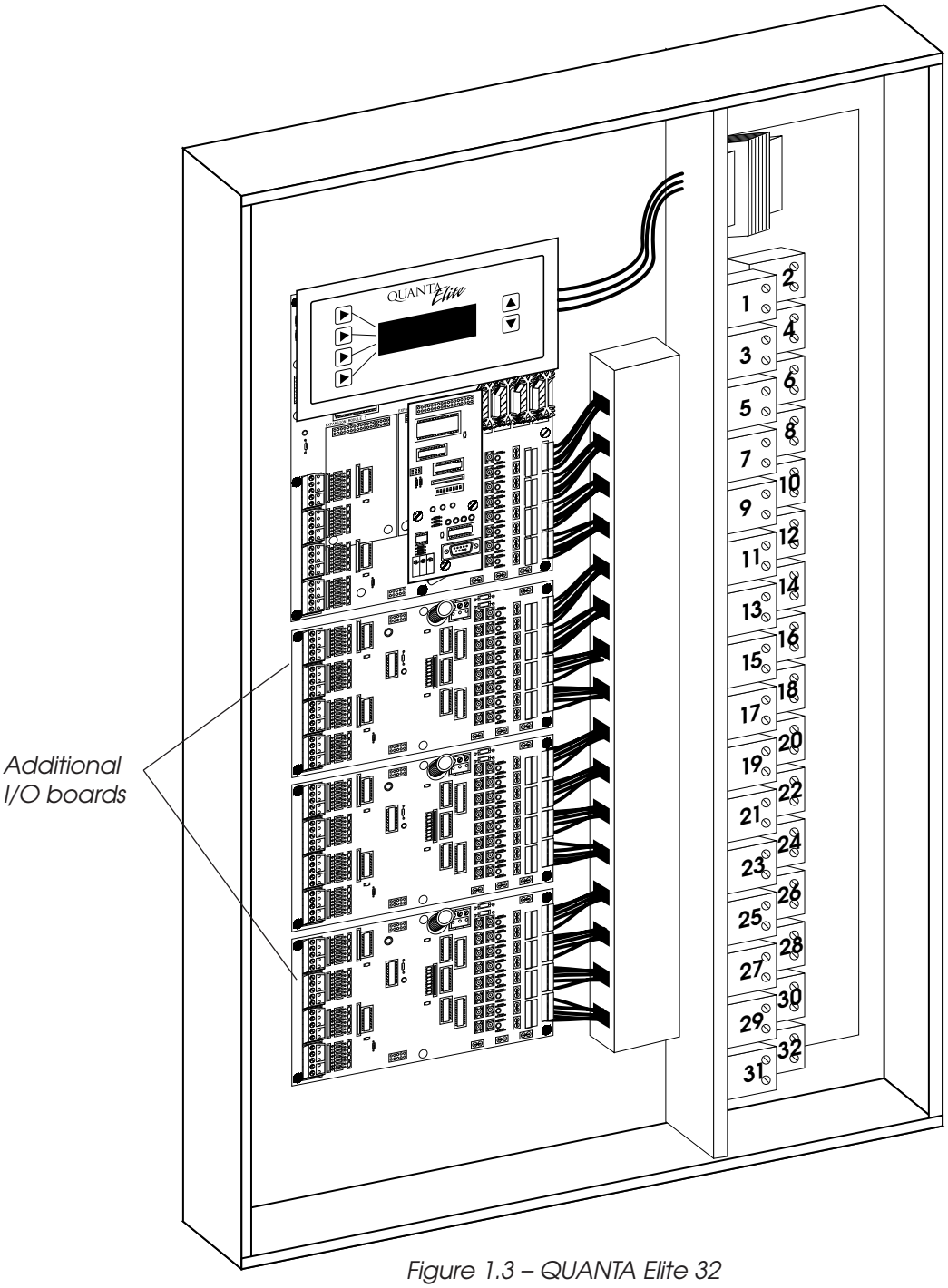


Figure 1.3 – QUANTA Elite 32

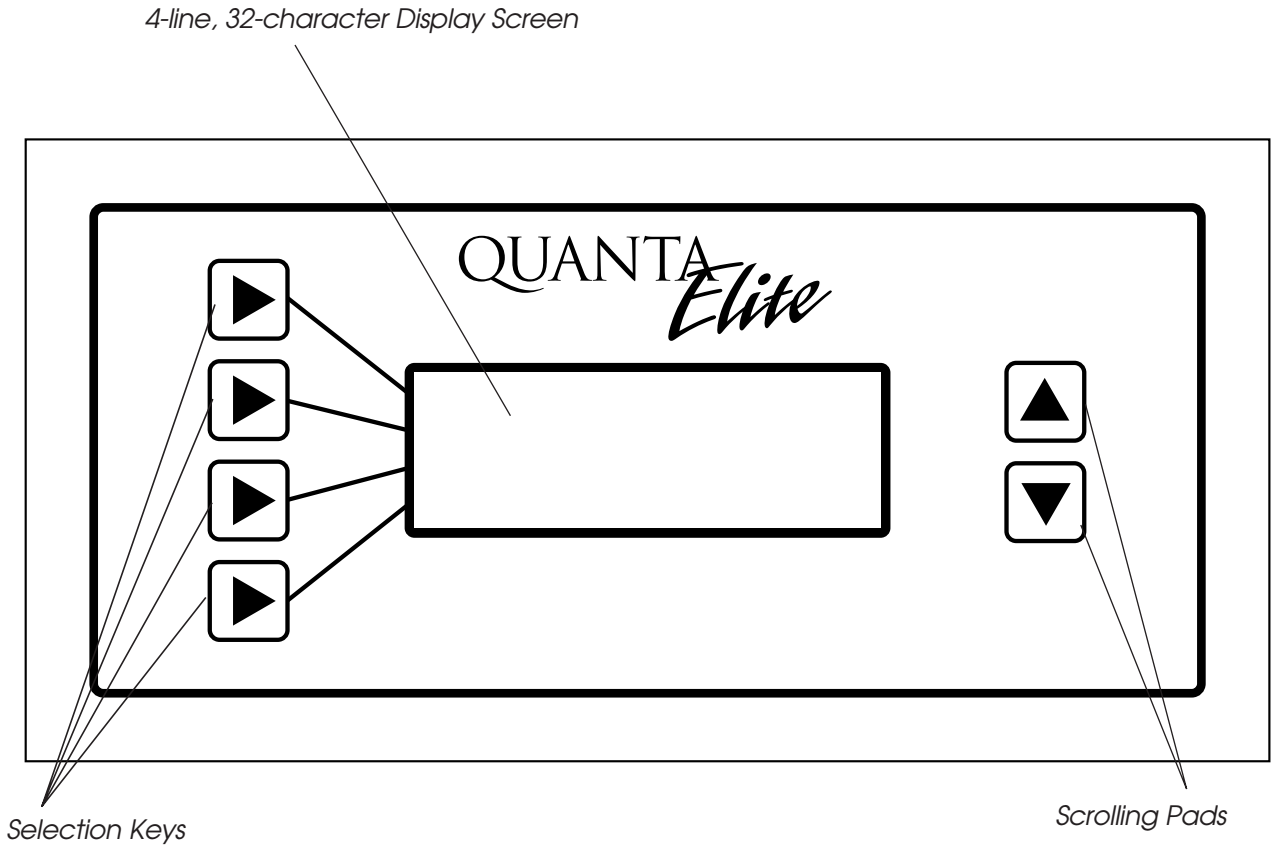


Figure 1.4 – Elite Keypad and Display

1.3 I/O Options

If your application requires, you can equip the controller with certain input/output options.

1.3.1 Telephone Switching – You can equip the controller with a DTMF (Dual Tone Multi Frequency) interface, which allows you to activate switch inputs via commands from a touchtone telephone. See Appendix A.

1.3.2 Pulsed Relay Output Operation – By adding conversion hardware to the relay outputs, you can convert the output from a maintained output to a pulsed output required for control of mechanically latching contactors and other devices that operate on a momentary rather than maintained application of power. Consult factory for details.

1.4 Programming with a PC

If you want to program the controller with a personal computer equipped with QUANTA Pro software, see Appendix B.

1.5 Expansion/Communications Options

With the addition of enhanced software and interface hardware, you can develop a LAN (local area network) composed of up to 256 nodes, each node controlling up to 48 I/O points. Consult Appendix C in this manual if your application requires expansion/networking.

If you want to program the controller over phone lines via a remote personal computer equipped with QUANTA Pro software, see Appendix A.

1.6 DMX Option

You can equip the QUANTA Elite with a DMX interface to control the non-dimmed loads that are part of a theatrical lighting control system. Consult factory if this option is applicable to your situation.

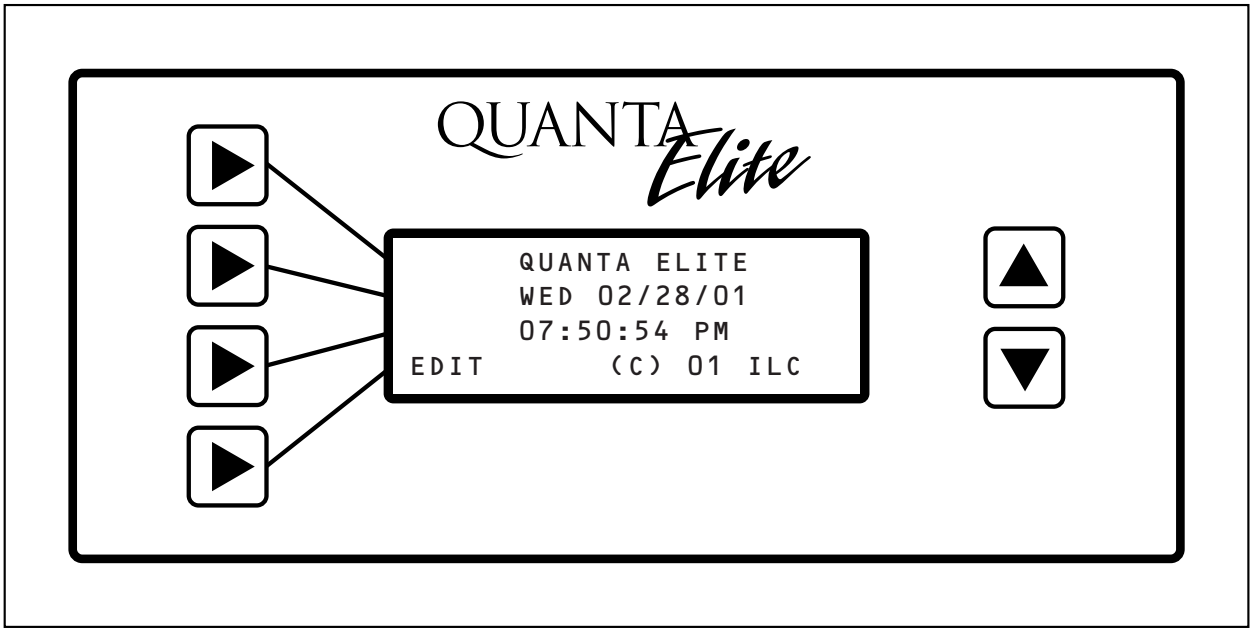
1.7 Enhanced Open/Close Time Control

If your control requirements call for time-based control keyed to multiple sets of Open/Close times, see Appendix E. – Master Scheduler.

1.8 N2 Communications

You can configure the QUANTA Elite as a node on a Building Automation System (BAS) N2 Communications Network. See Appendix N.

Section 2
Installation



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Objectives

This sections shows you how to install the QUANTA Elite Controller and how to perform required power-up verification checks. This section covers installation of the basic 48 I/O stand-alone controller. For information on optional features or communication/LAN systems, consult the appropriate appendix.

Overview

This section covers the following topics:

- Pre-installation checks
- Mounting the controller
- Wiring the controller
- Pre-power-up checks
- Power-up and checkout
- Troubleshooting

2.1 Pre-Installation Checks

Do the following before beginning the installation:

1. Verify that you have received the proper equipment. Check the packing slip against the materials you ordered and verify that the material is appropriate for the project. Check to ensure that the voltages of the controller(s) transformers match the available power. Report any discrepancies or visible damage at once.
2. Review submittal, programming worksheets, electrical prints, and other project documentation.
3. Ensure that you have a digital multi-meter.

2.2 Mounting the Controller

Consider the following when selecting a site for the QUANTA Elite.

2.2.1 Location – Typically, the QUANTA Elite controller is mounted near the lighting panel containing the circuits to be controlled by the lighting relays. The enclosure is manufactured with pre-drilled mounting holes located near the four corners of the rear wall of the enclosure. Secure the enclosure to the mounting surface with hardware appropriate for the application.

2.2.2 Environmental Considerations – The QUANTA Elite is designed to operate in temperatures between 0 and 50 degrees C (32-112°F.) and 10%-90% humidity non-condensing.

CAUTION

THE QUANTA ELITE SERIES CONTROLLER IS HOUSED IN A NEMA 1 ENCLOSURE. DO NOT INSTALL IN SITUATIONS REQUIRING SPECIAL PURPOSE ENCLOSURES OR IN AREAS WHERE THE CONTROLLER WILL BE SUBJECT TO CONDITIONS OUTSIDE ITS DESIGNED OPERATING RANGES.

2.2.3 Distance From Control Devices
Switches and other control devices can be located up to 1500 feet from the QUANTA Elite controller using 18 gauge wire.

2.3 Wiring the Controller

Perform the following procedures to wire the line and control circuits of the QUANTA Elite. Do ***NOT*** apply power to any circuits until instructed to do so.

2.3.1 Wire the Control Transformer
Run a dedicated 120 or 277 VAC circuit, including grounding conductor, and terminate it to the primary of QUANTA Elite control transformer. (See Figure 2.1.)

2.3.2 Connect Line and Load – Connect line and load wires of the line voltage circuits to the Lighting Relays.

2.3.3 Wire Switch Inputs - Wire the Class 2 Switch Circuits. (See Figure 2.2.)

1. Run the required wiring between the controller and the field-installed switches. Consult the programming worksheets and project documentation to determine the type and quantity of required switch circuits. Check each switch run to ensure that there are no shorts between conductors or to ground. Also verify that there are no opens.
2. Make the connections at the switch end.
3. Make the connections to the controller switch input terminals. ***(NOTE: REFER TO SWITCH INPUT SCHEDULE FOR LANDING WIRES TO INPUTS OR FILL IN SWITCH SCHEDULE AS YOU PROCEED.)***

2.3.4 Set Relay Response

If you want all relays to respond to a signal instantaneously rather than to stagger ON/OFF one at a time, add jumper W1 on the CPU I/O board. (See Figure 2.1.)

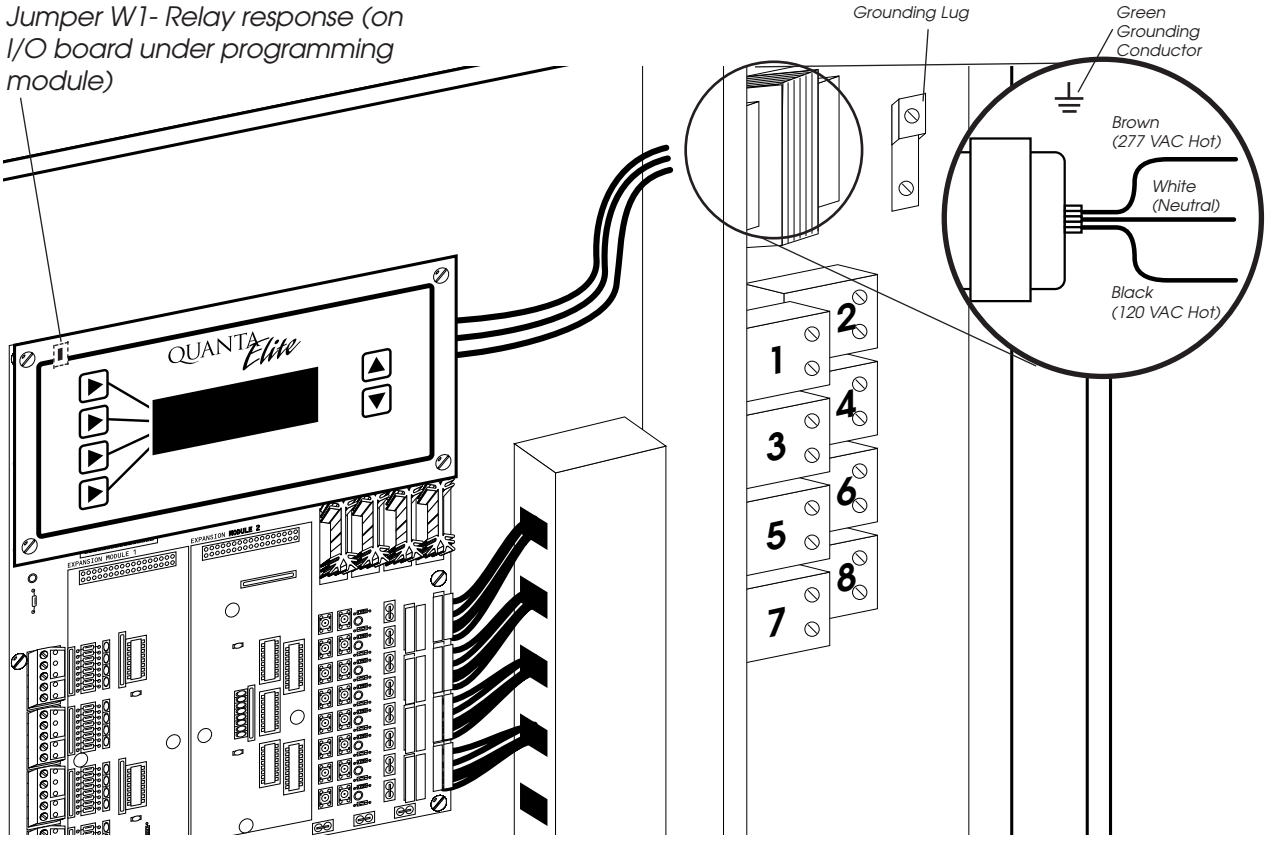


Figure 2.1 – Terminate Line to Control Transformer Primary

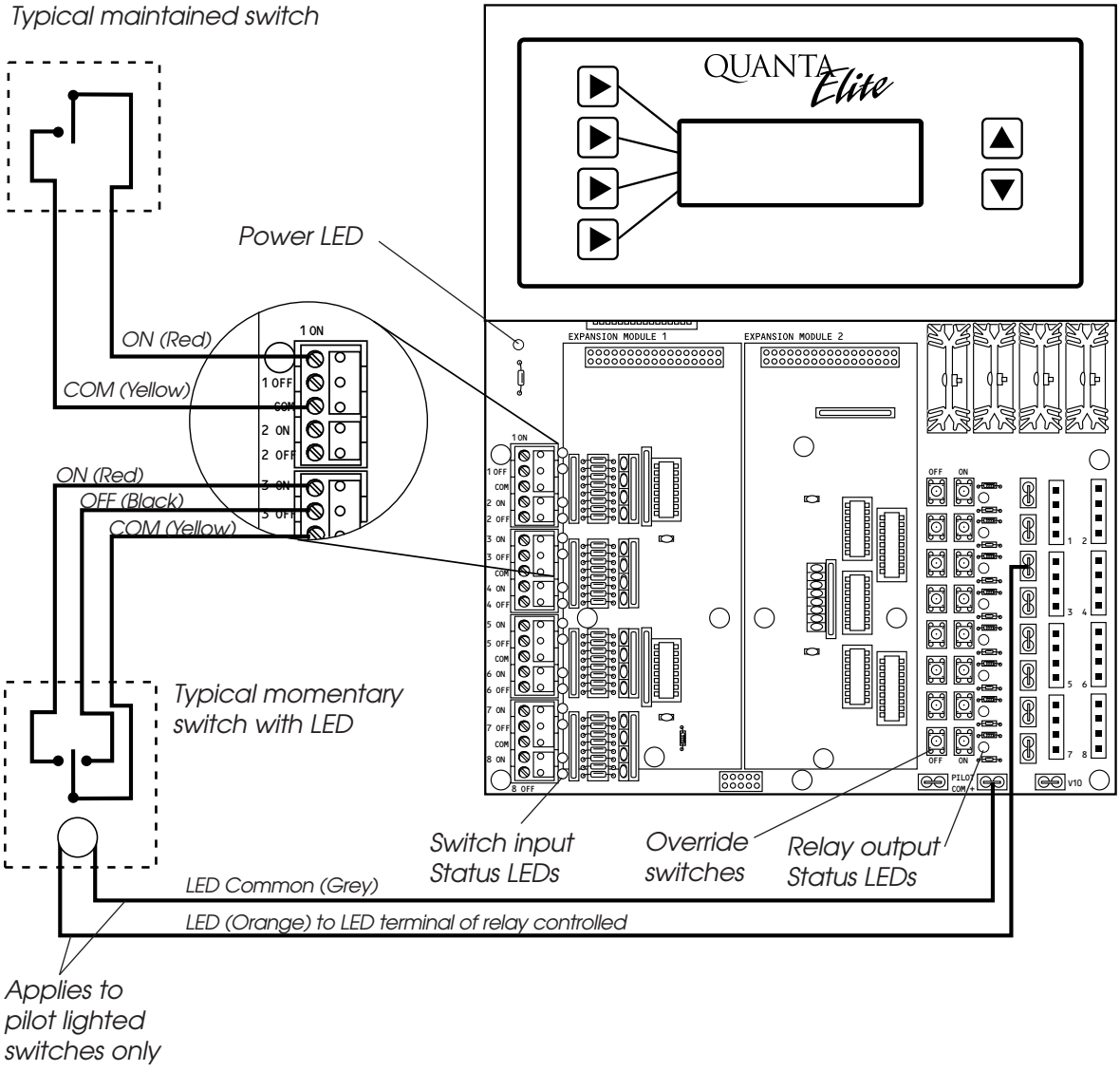


Figure 2.2 – Wire Class 2 Switch Circuits

2.4 Pre-Power Checks

Complete the following checks BEFORE applying power to the QUANTA Elite controller.

2.4.1 Check Controller Power Input

1. Verify that the controller power switch is OFF.
2. After verifying that control transformer source voltage is 120 or 277 VAC (whichever is appropriate), power-up the circuit.
3. Verify correct line voltage on the primary of the transformer.

2.4.2 Verify Controller's Supply Voltage

Verify that there is 24 VAC on control transformer secondary and 12 VAC between each leg and the center tap. (See Figure 1.2.)

2.4.3 Double-Check Connections

1. Verify integrity of I/O connections.
2. Verify integrity of all internal and external wire/cabling.

2.5 Power-Up and Check Out

Complete the following procedures to power-up and check out the QUANTA Elite controller.

2.5.1 Power-Up the Controller

1. Connect a handheld programming module if working with a QUANTA Elite that doesn't have an onboard keypad.
2. Turn the power switch located on the CPU I/O board ON. (See Figure 1.2.)
3. Verify that the controller keypad screen displays the default time and date.
4. Verify that the power light on each I/O board is lit. (See Figure 2.2.)

2.5.2 Verify the Lighting Relays

Switch each relay ON and OFF, pushing the override switches located on the CPU I/O and the other I/O boards. There are separate ON and OFF switches for each lighting relay. (See Figure 2.2.) Verify that the relay status LED goes ON and OFF and that the relay itself changes state. Verify that the relay controls the proper circuit.

2.5.3 Perform Initial Programming Procedures (See Section 3.)

1. Set the correct date & time on the controller.
2. Program the switch inputs & timers.

2.5.4 Verify the Switching Function

1 .Operate each switch.

2. Verify that each switch controls the correct lighting relays in the manner you have programmed.

2.5.5 Verify the Timer Functions –

1. Set the controller clock 10 minutes prior to the times required for each programmed timer to occur.
2. Verify that the relays respond as programmed.
3. Reset the controller clock to the correct date and time.

2.6 Troubleshooting

In the event of trouble, use the following procedures to identify the problem.

2.6.1 Controller Will Not Power-Up

1. Verify that there is 120/277 VAC on the primary and 24 VAC on the secondary of the control transformer.
2. Verify that the power LED on the CPU I/O board is lit.
3. If there is proper primary and secondary voltage on the transformer but the power LED is not lit and the keypad screen doesn't come up, the controller CPU I/O board may be defective.

2.6.2 Lighting Relay(s) Will Not Function

1. Verify that there is 24 VAC on Control Transformer secondary.
2. Make sure that lighting control wiring is landed properly on the relay output of the CPU I/O or other I/O boards. (Blue is common, red is ON, black is OFF, orange is status.) (See Figure 1.1.)
3. Override the affected relay ON/OFF with the override switches located on the I/O board. (See Figure 1.2.)
4. If the relay doesn't respond, replace the relay.

2.6.3 Switch Input Will Not Function

1. Check your programming.
2. Verify proper connections at field and controller end.
3. Verify that there is only one maintained switch connected per input.
4. Unhook field connections from affected input. Connect test switch of same type as field switch.
5. Work the test switch. Observe whether the switch input status LED lights when it senses a switch closure.
6. If the switch input status LED lights and the relays function properly, there is probably a problem with the field wiring.
7. Verify that the CPU is seeing the switch input by *viewing the current switch status*. This can be done with the keypad by going to the *Switch Status* screen and scrolling to the individual input or scanning all of the inputs to verify that a switch closure is being seen by the controller (step-by-step procedure is on page 3 - 6). Also the outputs of the CPU and I/O boards can be tested through the keypad. Relays can be forced individually or all swept ON or OFF using the keypad (a step-by-step procedure can be followed on page 3 - 3).
8. If the switch input or affected relay doesn't respond (or no response is viewed through the keypad), the affected CPU or I/O may be defective.

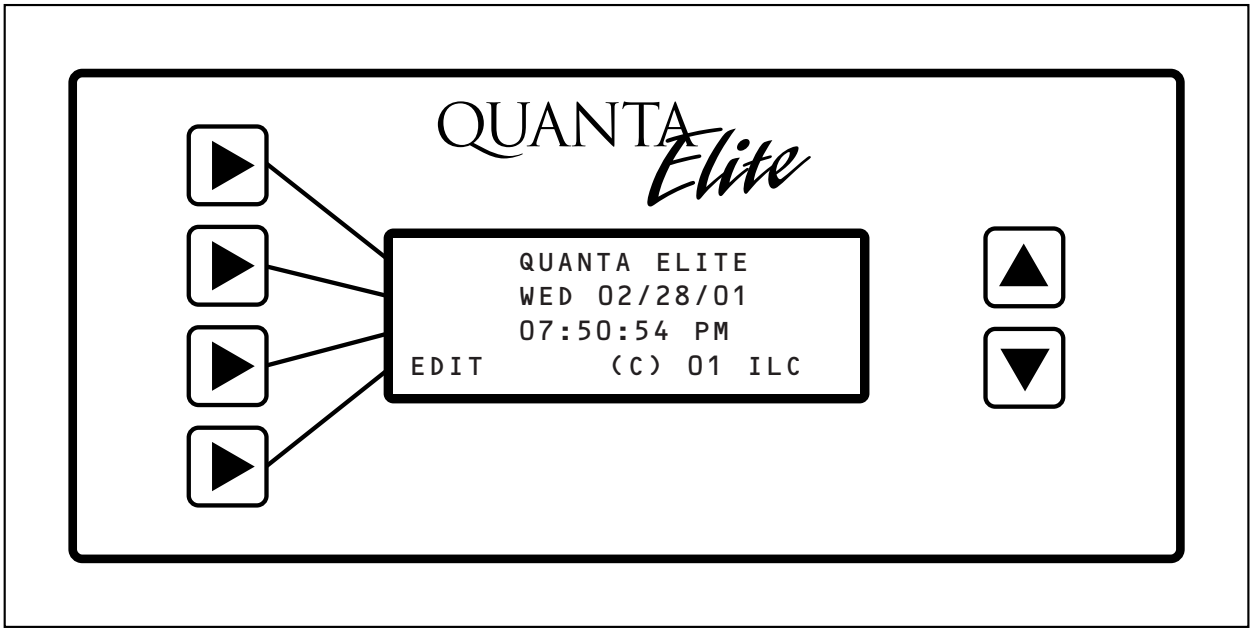
2.6.4 Timers Will Not Function Properly

1. Check your programming.
2. Verify the affected output integrity by mapping a switch input to the output and triggering it with a test switch. If the relay doesn't react, you may have a defective I/O board. Consult factory.

2.6.5 Entire I/O Board(s) Doesn't Work

1. Check to ensure that the data and power cables linking the I/O boards are connected properly and are free of opens and shorts.
2. Check to ensure that the power LED on the I/O board is lit.
3. Verify that the CPU sees the expansion I/O boards, using the keypad. This can be done by going to the Relay Status screen and scrolling through the outputs to see if the CPU sees all of the outputs (a step-by-step procedure is on page 3 - 3).
4. If the I/O board is not recognized by the CPU, you may have a defective board or data cable.

Section 3
Programming



Section 3 Programming

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Objectives

In this section you will learn how to program the QUANTA Elite Controller.

Conventions/Definitions

Actual key strokes/entries appear as arrows: for example, ▶ followed (if applicable) by the appropriate keyword. For example, to leave the Home screen, the entry is ▶ EDIT. (See the figure below.)

The term **default** appears in this section. Default means the value or entry preprogrammed at the factory. In many cases the default may be appropriate for your application, making field programming unnecessary. For example, momentary ON/OFF is the default switch type; therefore, if 3-wire momentary switches are used exclusively at your facility, switch input definition will not be necessary.

Another term used often is **Home screen.** The Home screen is the top level screen of the controller. It features the controller name, the date and the time. (See Figure 3.1.) The controller displays this screen on power-up and at times when you are not programming or checking input/output status.

Automatic Timeout/Data Saving

If you do not press any keys for 30 seconds while you are programming, the controller will automatically return to the Home screen and **save** whatever data was entered. Therefore you can save entries simply by stopping keystrokes or by entering the proper keyword – usually ▶ EXIT or ▶ SAVE.

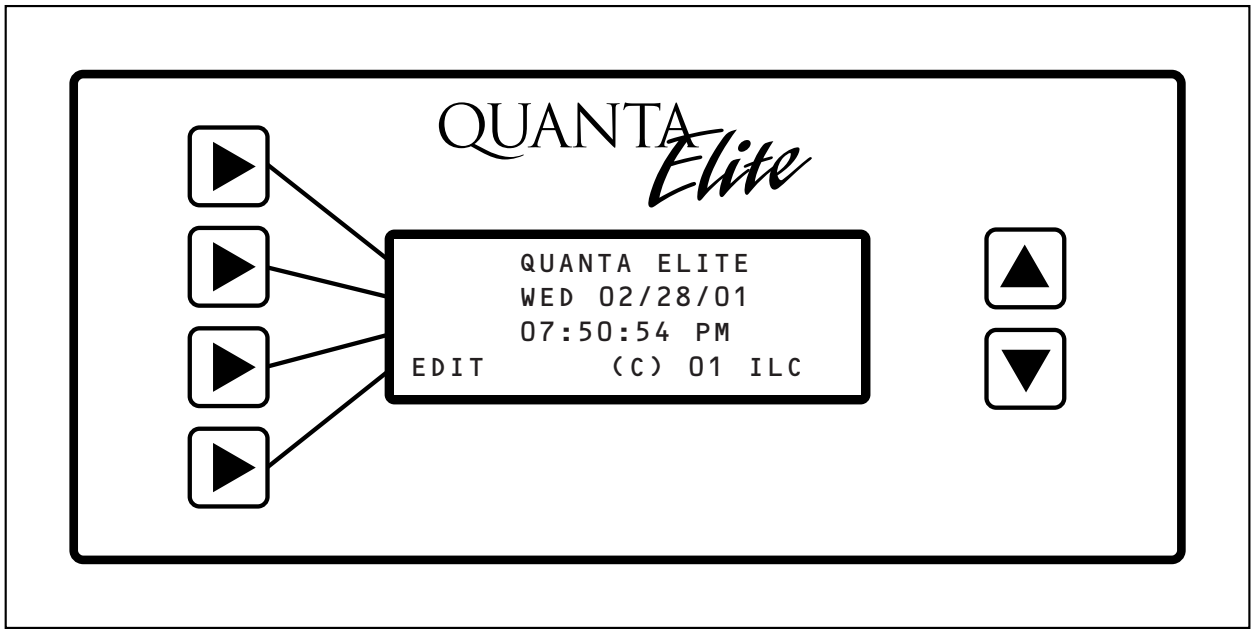


Figure 3.1 - QUANTA Elite Home Screen

3.1 Relay Status

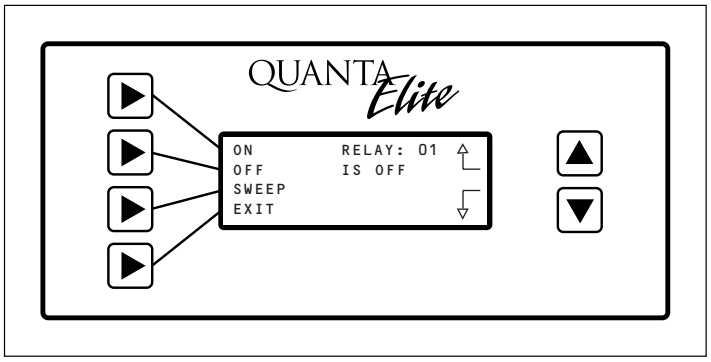
View current relay status or turn relay(s) ON or OFF directly from the keypad.

WHAT IS IT?

This feature permits you to view the current ON/OFF state of the relay outputs. In addition, you can turn a selected relay ON or OFF or you can turn all the relays ON or OFF.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT.
2. Then press ▶ RELAY STATUS to access the top level Relay Status screen. (See Figure 3.2.)



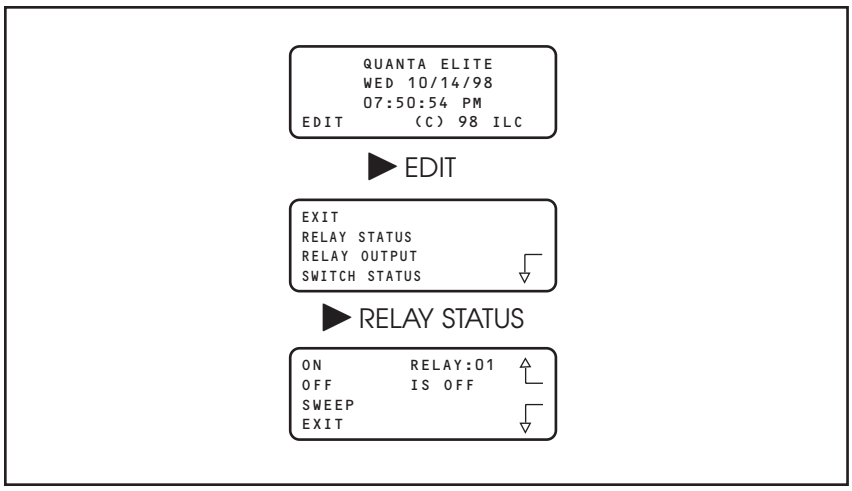
Top Level Relay Status Screen

Parameter Key:

ON = turn the selected relay ON

OFF = turn the selected relay OFF

SWEEP = turn **ALL RELAYS ON** or **ALL RELAYS OFF**



Relay Status Screen Flow

Figure 3.2

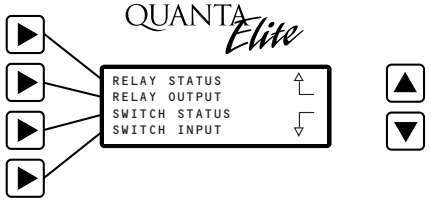
3.2 Controlling Relays From the Keypad

WHAT DO I DO?

1. From the Home screen, press ▶ EDIT.

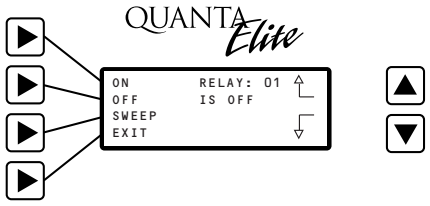
Step 1

2. Press ▶ RELAY STATUS.



Step 2

3. Press ▲ until the relay to be overridden appears on the screen.
4. Press either ▶ ON or ▶ OFF to override the relay to the desired state.



Steps 3 & 4

5. To turn all the relays ON or OFF, press ▶ SWEEP; then press either ▶ ALL RELAYS ON or ▶ ALL RELAYS OFF.
6. Press ▶ EXIT to return to the top level Relay Status screen.
7. Press ▶ EXIT to return to the Home screen.

Step 5

3.3 Relay Output

Configure relay output properties such as Blink functions and power-up options.

WHAT IS IT?

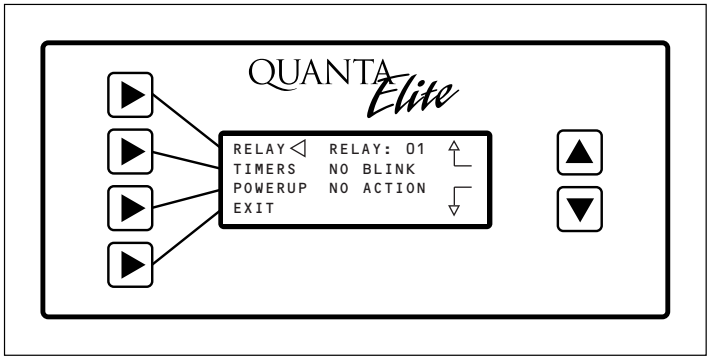
Use relay output definition to determine the way each relay output responds to impending OFF timers and the application/ re-application of power to the QUANTA Elite controller. The controller blinks (momentarily turns OFF/ON each relay controlled by an upcoming OFF) as a warning. (NO BLINK is the default entry.) Blinking is not appropriate for some types of lighting, such as HID. As an alternative to a blink alert, you can program one of the relay outputs to energize an ALARM external to the controller. The alarm sounds when a relay defined for an HID DELAY is about to be turned OFF by a timer.

You can program how each relay output responds to the application or re-application of AC power to the controller. The default setting is NO ACTION (the relay will not change state on controller power-up). The other choices are for the relay to TURN ON or TURN OFF on controller power-up.

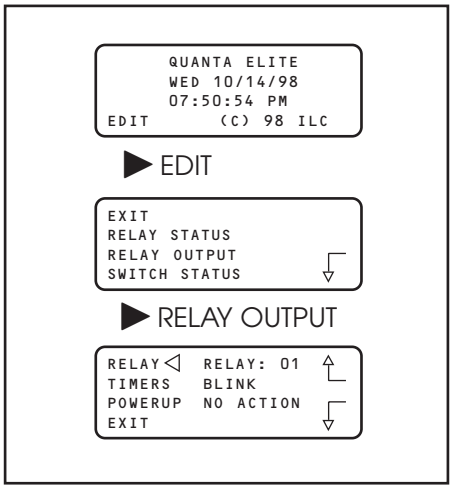
There are two additional choices available. You can program the relay output to turn ON if switch input number 1 is ON (ON/IN:1) or turn OFF (OFF/IN:1) if switch input 1 is ON at time of power-up.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT.
2. Press ▶ RELAY OUTPUT from the Menu screen. (See Figure 3.3.)



Relay Output Definition Screen



Relay Output Definition Screen

Parameter Key:

TIMER = relay output to be defined (1 – 48)

TIMERS = how the relay will respond to an impending timer. Default is **NO BLINK.** Other possible entries: **BLINK, HID DISPLAY, ALARM**

POWERUP = how the relay responds to application or re-application of controller power. Default is **NO ACTION**

Figure 3.3

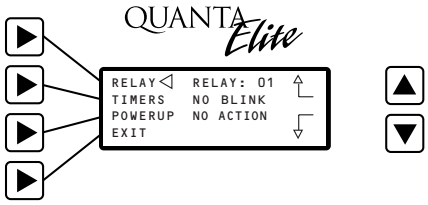
3.4 Set Relay Parameters

WHAT DO I DO?

NOTE: The default parameters are for the relays to not blink alert an upcoming OFF timer and take no action on controller power-up. If these are appropriate for the application, you can skip this section.

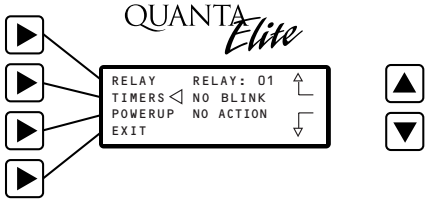
1. From the Home screen, press ▶ EDIT; then press ▶ RELAY OUTPUT.

2. RELAY appears; then press ▲ until the relay you want to define appears.



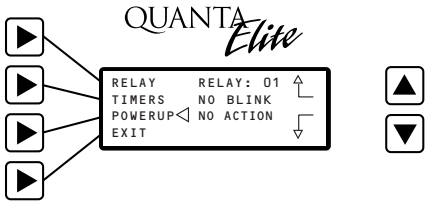
Step 2

3. Press ▶ TIMERS; then press ▲ until the desired response of the relay to an upcoming OFF timer appears.



Step 3

4. Press ▶ POWERUP until the desired relay response to a controller powerup appears.



Step 4

5. Press ▶ EXIT twice to return to the Home screen.

3.5 Switch Status

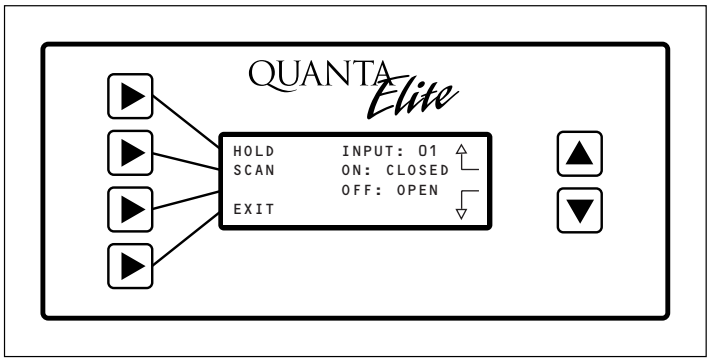
View current switch input status for any switch input or scan all switch inputs.

WHAT IS IT?

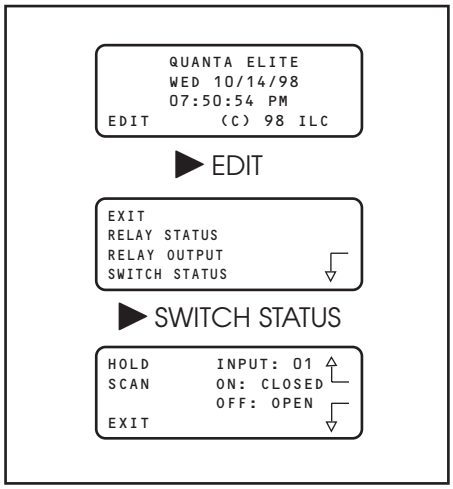
You can view the current status of each switch input. The Switch Status screen will display maintained switch inputs as either OPEN or CLOSED. Momentary inputs are displayed as OPEN when the switch is in the neutral position. During actuation, a momentary OPEN or CLOSED message displays on the screen if the currently selected input is actuated.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT.
2. Press ▶ SWITCH STATUS to access the Switch Status screen. (See Figure 3.4.)



Switch Status Screen



Switch Status Definition Screens

Figure 3.4

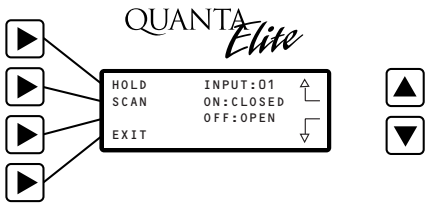
3.6 View Current Switch Status

WHAT DO I DO?

1. Press ▶ HOLD; then press ▲ or ▼ to select the input you want to check.

2. If you press ▶ SCAN while viewing an input, the controller will automatically display the input that has changed state.

3. Press ▶ EXIT to leave the screen.



Step 1

3.7 Switch Input

Configure the switch type for switch inputs

WHAT IS IT?

Switch input is used to program the characteristics of each QUANTA Elite controller input. Each of the controller inputs can be connected to either a 2-wire and 3-wire momentary switch or to maintained switch(s). You can program each input as one of the available switch types. Consult Table 3.1 for a description of each switch type and the required physical characteristics of the switch used to trigger the switch type function.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT; then press ▼.
2. Press ▶ SWITCH INPUT. (See Figure 3.5.)

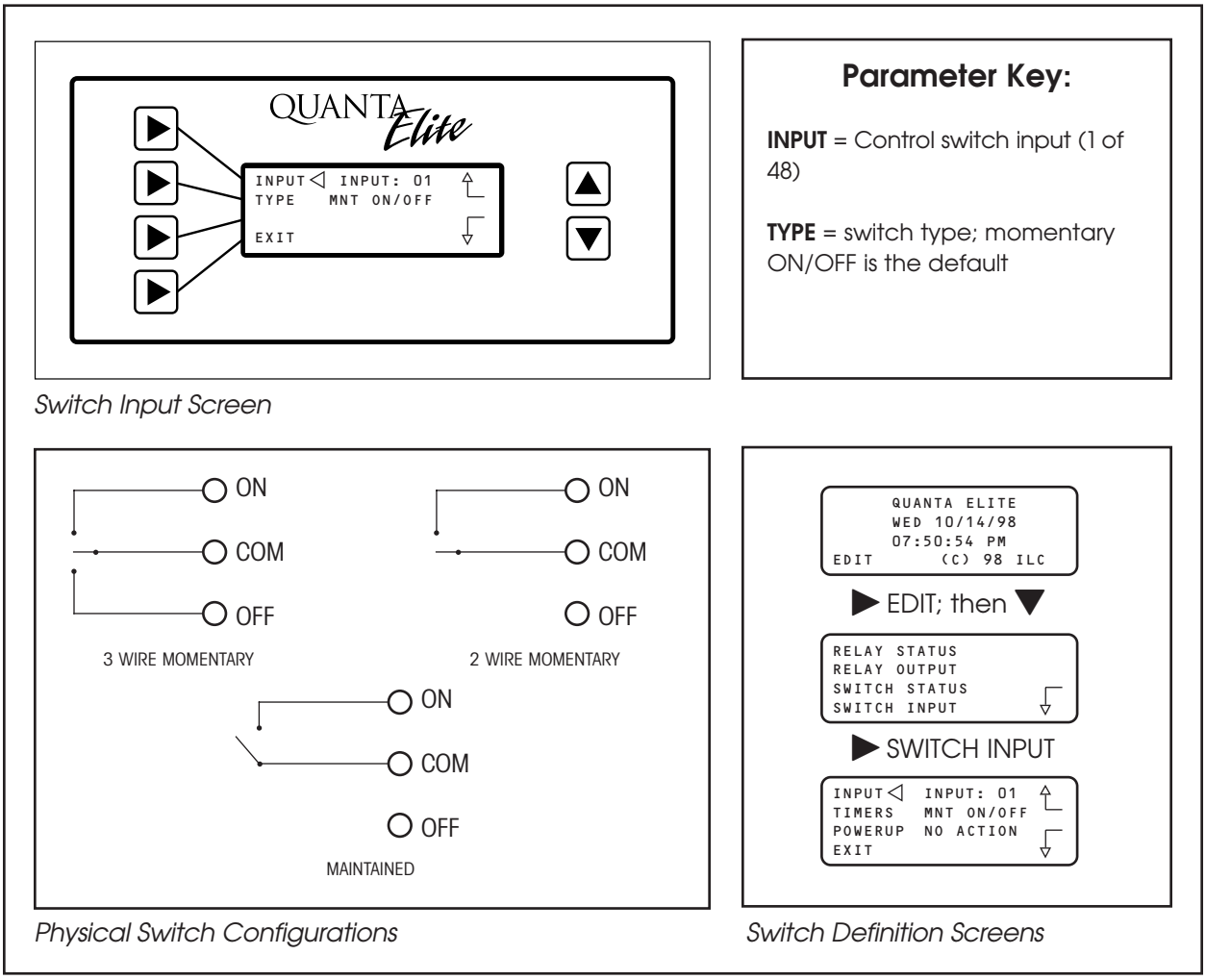


Figure 3.5

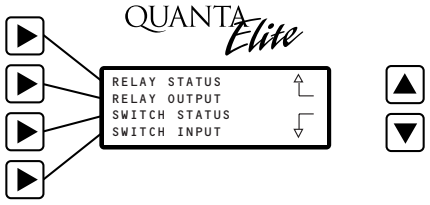
3.8 Programming a Switch Input

WHAT DO I DO?

1. From the Home screen, press ▶ EDIT.

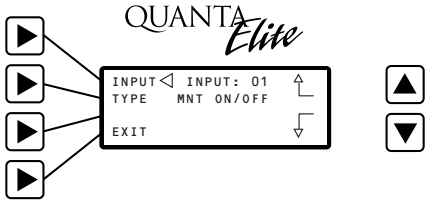
Step 1

2. Press ▼; then press ▶ SWITCH INPUT.



Step 2

3. Press ▲ to select the switch input that controls the relay.
4. Press ▶ TYPE; then press ▲ until the desired switch type appears on the screen.



Steps 3 & 4

5. Press ▶ EXIT; then press ▲ and ▶ EXIT again to return to the Home screen.

Type	Physical	Operation
Momentary ON/OFF	3-wire momentary	Momentary contact between ON and Common turn controlled relay outputs ON. Momentary contact between OFF and Common turn controlled relay outputs OFF.
Momentary Pushbutton	2-wire momentary	Momentary contact between ON and Common turn controlled relays ON and OFF alternately each time contact is made.
Maintained ON/OFF	2-wire maintained	When contact between ON and Common are made, controlled relays turn ON. When contact is broken, controlled relays turn OFF.
Maintained Multi-way	2-wire maintained	When contact is made or broken between ON and Common, the controlled relays will toggle from ON to OFF or OFF to ON; similar to conventional 3-way switching.
Set Preset	2-wire Momentary	When momentary contact between ON and Common is made, the controlled relay outputs will go to their programmed states.
Timed ON	2-wire momentary	Contact between ON and Common will turn relay outputs on for a programmed time. At the end of this time the controlled relays will turn OFF.
Two-Step Pattern	2-wire momentary	Upon switch activation, Group A relays turn ON and Group B turn OFF. The following activation causes Group A to turn OFF and Group B to turn ON. The pattern repeats with each switch activation.
Four-Step Pattern	2-wire momentary	On the first activation, Group A relays turn ON and Group B turn OFF. On the second activation, Group A turns OFF and B turns ON. The third activation causes both A and B to go ON. On the fourth activation, both A and B go OFF. Then the pattern repeats.
Input Disable	2-wire maintained	As long as the switch is closed, other selected inputs are disabled.
Timer Disable	2 wire maintained	As long as the switch is closed, selected timers are disabled.
Network Disable	2-wire maintained	As long as the switch is closed, all network commands are disabled.
Output Override	2-wired maintained	As long as the switch is closed, selected relay output(s) will ignore all input, timer, or network commands.

Table 3.1 QUANTA Elite Switch Types

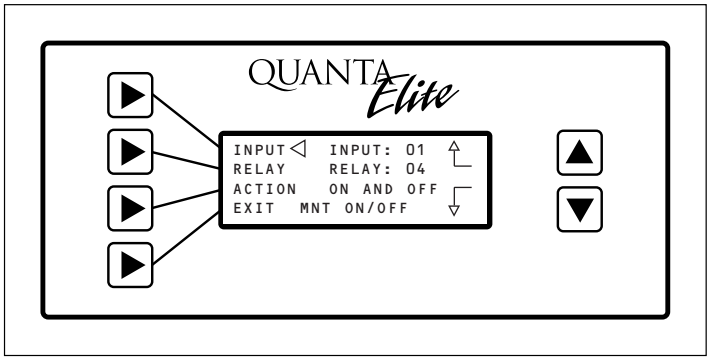
3.9 Input/Relay Control

WHAT IS IT?

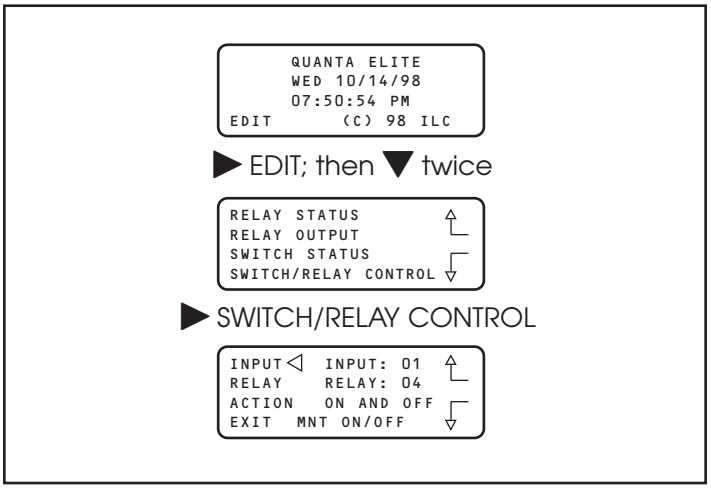
This is the feature used to select which relay output or outputs respond to a particular switch input actuation. You can program a switch input to control any or all of a QUANTA Elite controller's relay outputs. The controller can have up to 48 relay outputs. Each Relay Output(s) can be programmed to respond in one of the following ways: NO ACTION, ON ONLY, OFF ONLY, or ON AND OFF.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT; then press ▼ twice.
2. Then press ▶ INPUT/RELAY CONTROL. (See Figure 3.6.)



Input/Relay Control Screen



Input/Relay Definition Screens

Parameter Key:

INPUT = the number of the controlling switch (1-48)

RELAY = the number of the controlled Relay Output (1-48)

ACTION = how the relay responds to switch actuation (NO ACTION is the default.)

Figure 3.6

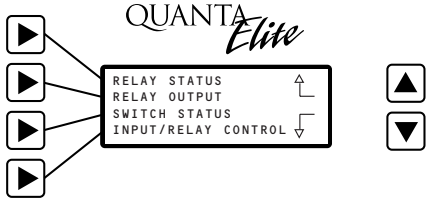
3.10 Map a Switch to a Relay Output

WHAT DO I DO?

1. From the Home screen, press ▶ EDIT.

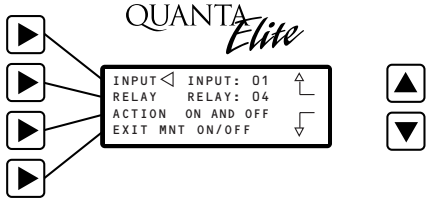
Step 1

2. Press ▼ twice; then press ▶ INPUT/RELAY CONTROL.



Step 2

3. INPUT is displayed; then press ▲ until the controlling input you want appears.
4. Press ▶ RELAY; then press ▲ until the relay to be controlled appears.
5. Press ▶ ACTION; then press ▲ until the desired relay response appears.



Steps 3, 4, 5

6. Press ▶ EXIT; then press ▲ twice and ▶ EXIT again to return to the Home screen.

3.11 Timers

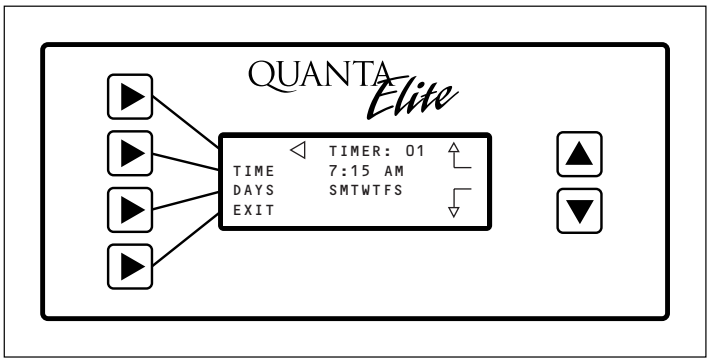
Configure timers for automatic time scheduled activation.

WHAT IS IT?

Timers are time-based events that impact selected relay outputs. The QUANTA Elite controller supports up to 48 different timers. Each timer can control any or all of the relay outputs. You can program the timer to turn relay(s) ON or OFF or not impact the relay(s) at all. You can set the controller to execute a timer on one or more days of the week or a particular holiday. The controller supports the definition of up to 48 Holidays. You can program the timer to occur at an actual time of day (for example, 10:30 PM) or you can define the occurrence in Astro time. Astro time is time defined in relation to sunrise or sunset. (See 3.26 if you are using the OPEN/CLOSE feature.)

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT; then press ▼ 3 times.
2. Press ▶ TIMERS from the menu to access the top level Timer Definition screen.



Top Level Timer Definition Screen

Parameter Key:

TIMER = a time-based event that impacts one or more relays

TIME = when the TIMER occurs expressed in either **NORMAL** or **ASTRO** TIME. NORMAL TIME is defined in **HOUR**(s) and **MINUTE**(s) AM or PM. ASTRO TIME is defined in relation to **SUNRISE** or **SUNSET.**

DAYS = **DAILY**, the day(s) of the week of TIMER occurrence; or **HOLIDAY**, the holiday date of occurrence.

Figure 3.7(a)

3.11 Timers

Configure timers for automatic time scheduled activation.

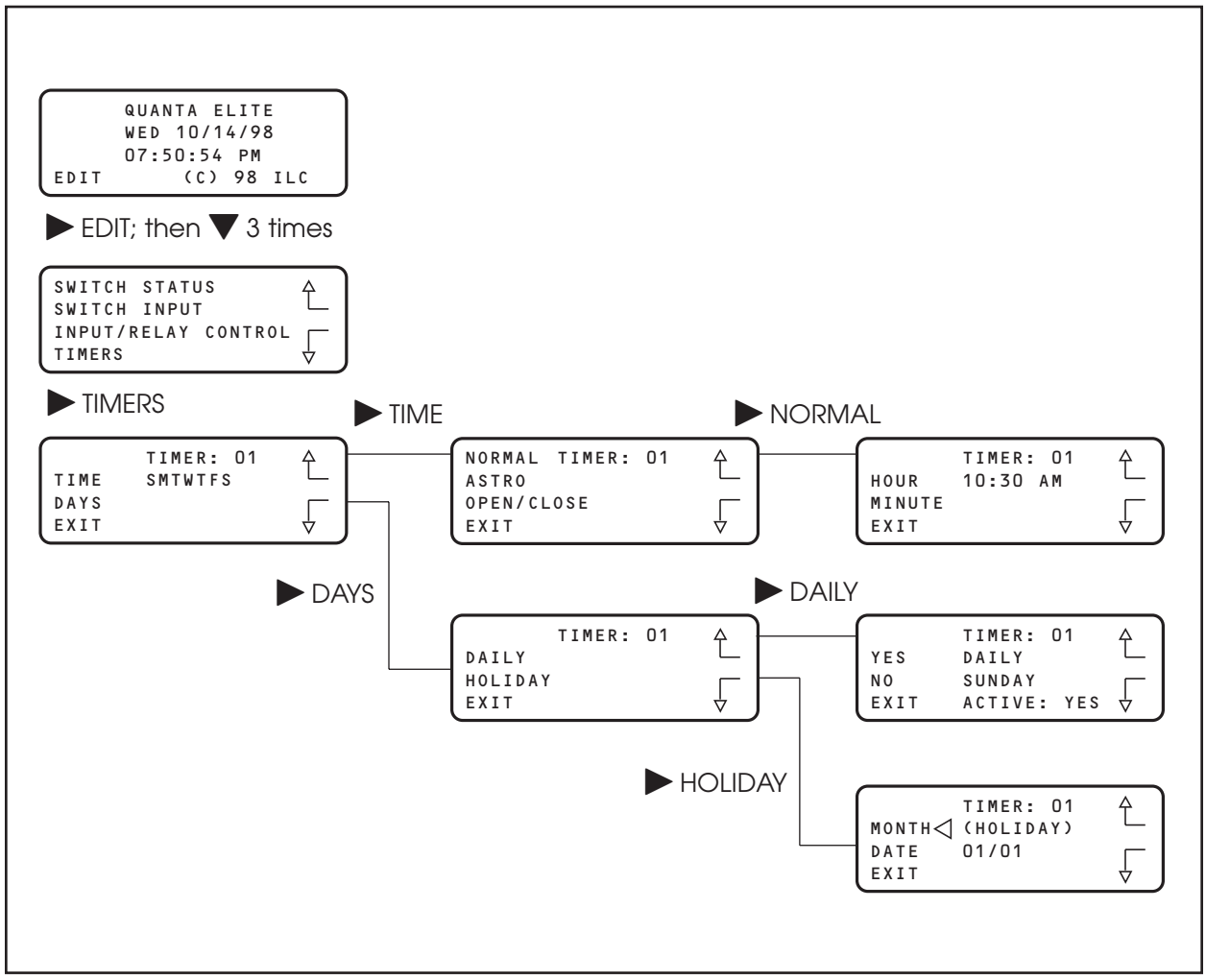


Figure 3.7(b)

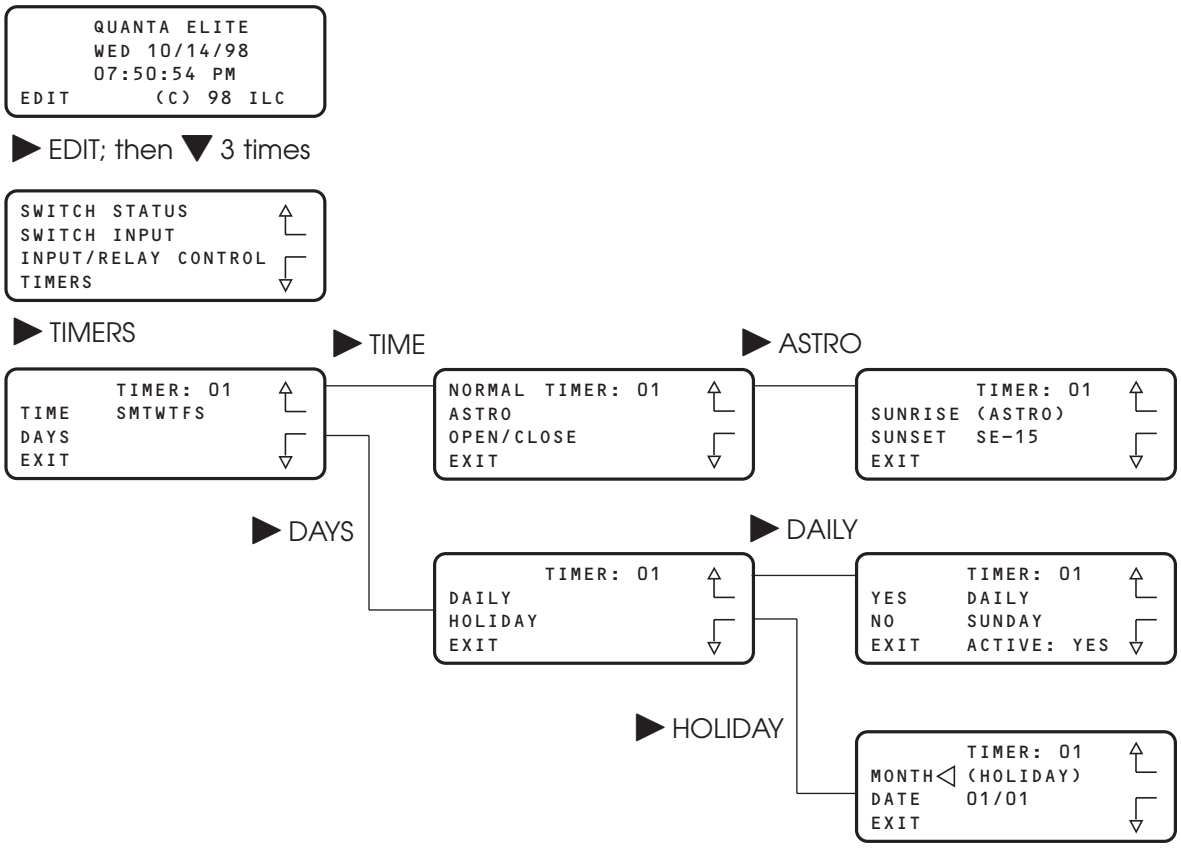
ASTRO TIME – WHAT MORE MUST I KNOW?

Astro time is the time relative to sunrise and sunset. Defining a timer in Astro time is especially useful in parking, security, and other outdoor lighting applications. You can set the timer to occur either exactly at sunrise or sunset or from 15 to 120 minutes before or after these times in 15-minute increments. See Figure 3-8 for ASTRO TIMER programming path.

To execute ASTRO time timers, you must program the controller with the proper latitude, longitude, and time zone coordinates. You do this by programming the SET ASTRO CLOCK feature discussed in Section 3-18.

3.11 Timers

Configure timers for automatic time scheduled activation.



Timer Definition Screens (Astro)

Figure 3.8

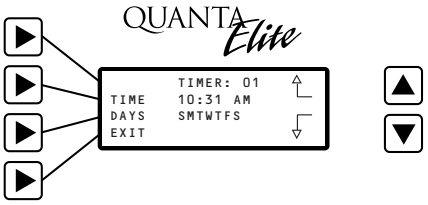
3.12 Define a Timer

WHAT DO I DO?

1. From the Home screen, press ▶ EDIT; then press ▼ 3 times.

2. Press ▶ TIMERS.

3. Press ▲ until the Timer to be defined appears on the screen.

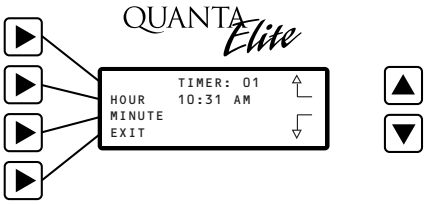


Step 3

4. Press ▶ TIME; then press ▶ NORMAL to select conventional AM/PM time.

5. HOUR is displayed; then press ▲ or ▼ until the desired hour (AM or PM) appears.

6. Press ▶ MINUTE; then press ▲ or ▼ until the desired minute appears; then press ▶ EXIT.



Steps 5 & 6

7. Press ▶ DAYS; then press ▶ DAILY.

8. Press ▲ or ▼ and as each day appears, press either ▶ YES or ▶ NO to select whether or not the Timer is to be active on that day.

Step 8

9. Press ▶ EXIT twice; then press ▲ 3 times, and ▶ EXIT once more to return to the Home screen.

3.13 Timer/Relay Control

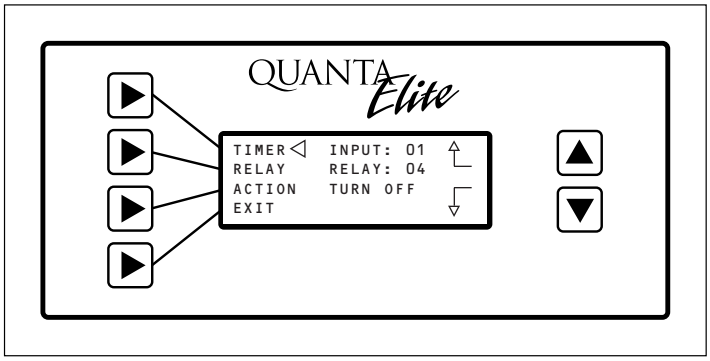
Program timers to control relay outputs.

WHAT IS IT?

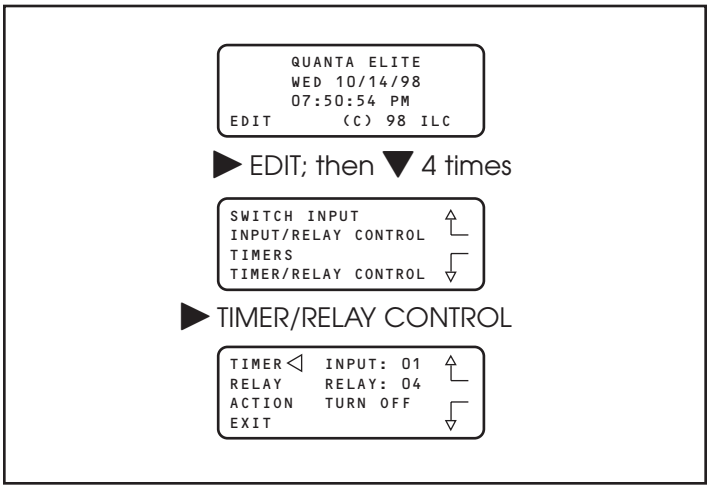
This is the feature used to determine how relay output(s) respond to the timers you have defined. Each timer can control anywhere from one to all 48 relay outputs. Each controlled relay can be turned ON or turned OFF or can be set to not respond at all. The default response is NO ACTION.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT; then press ▼ 4 times.
2. Press ▶ TIMER/RELAY CONTROL. (See Figure 3.9.)



Timer/Relay Control Screen



Timer/Relay Definition Screens

Parameter Key:

TIMER = one of up to 48 time-based events impacting a relay

RELAY = one of up to 48 relay outputs controlled by the timer

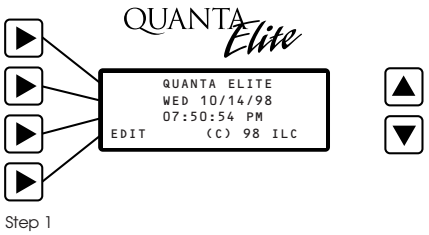
ACTION = how the relay responds to the timer. The relay may go ON, or OFF, or take NO ACTION

Figure 3.9

3.14 Map the Timer to a Relay Output

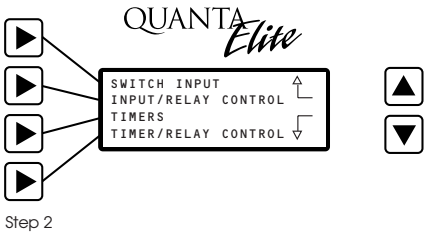
WHAT DO I DO?

1. From the Home screen, press ▶ EDIT.



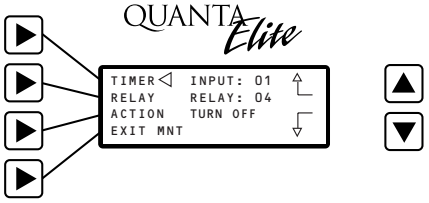
Step 1

2. Press ▼ 4 times; then press ▶ TIMER/RELAY CONTROL.



Step 2

3. TIMER appears; then press ▲ until the timer number you want appears.
4. Press ▶ RELAY; then press ▲ until the relay to be controlled appears.
5. Press ▶ ACTION; then press ▲ until the desired relay response appears.



Steps 3, 4, 5

6. Press ▶ EXIT; then press ▲ 4 times and ▶ EXIT again to return to the Home screen.

3.15 Blink Alerts

Configure the Blink Alert duration and override times.

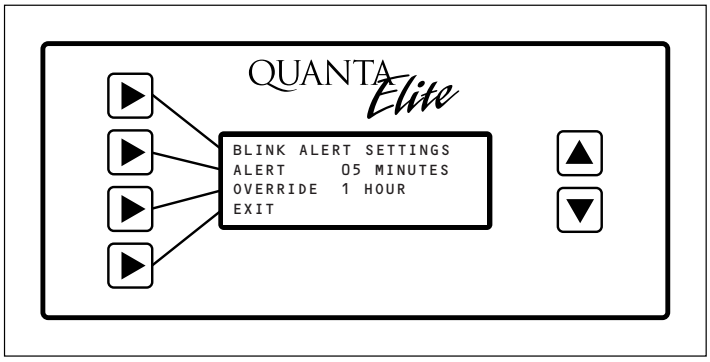
WHAT IS IT?

If any of the relays are subject to the Blink Alert, HID delay or alarm function, you must specify when the QUANTA Elite controller will execute the alert. The choices are from 1 to 5 minutes before the OFF Timer; 5 minutes is the default. The controller supports an override feature.

When the controller executes an alert, you can activate any switch to override the OFF timer for the override time.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT, then press ▼ 5 times.
2. From the menu, press ▶ BLINK ALERTS to access the Blink Alert Settings screen. (See Figure 3.10.)

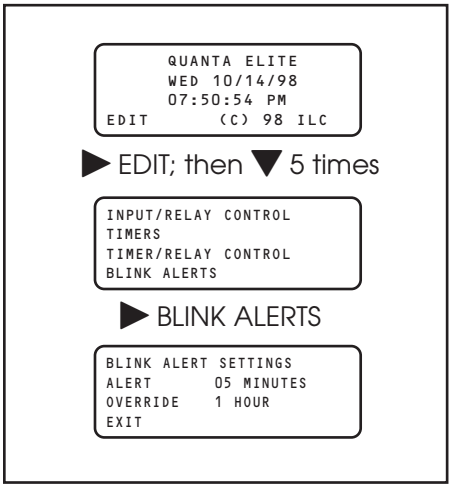


Blink Alert Settings Screen

Parameter Key:

ALERT = lead time of alert from 1 to 10 minutes in increments of 1 minute. The default is 5 minutes

OVERRIDE = time that the OFF Timer will be postponed in response to the override switch signal. From 1 to 6 hours in increments of 1 hour. The default is 1 hour



Blink Alerts Definition Screens

Figure 3.10

3.15 Blink Alerts

Configure Blink Alert duration and override times.

WHAT DO I DO?

1. Press ▶ ALERT until the desired lead time appears.
2. Press ▶ OVERRIDE until the desired override duration appears.

Steps 1&2

3. Press ▶ EXIT to leave the Blink Alert Settings screen.

3.16 Set Time and Date

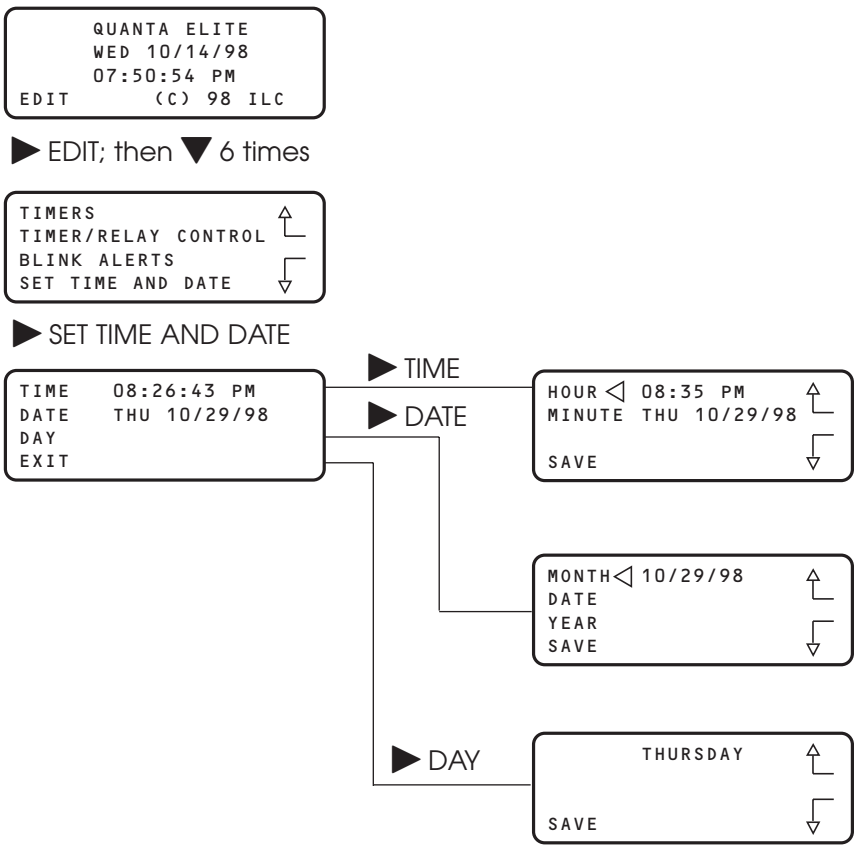
Set system clock date and time.

WHAT IS IT?

This is how you set the QUANTA Elite controller's clock to the proper time and date. This operation is necessary to implement the time-based control features of the controller.

HOW DO I GET THERE?

- From the Home screen, press ▶ EDIT; then press ▼ 6 times.
- Then press ▶ SET TIME AND DATE from the menu of screen choices. (See Figure 3.11.)



Time and Date Definition Screens

Figure 3.11

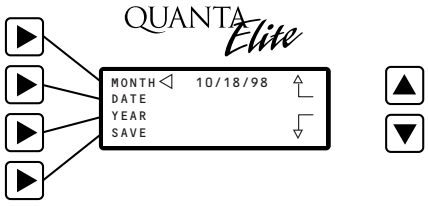
3.17 Set the Controller Clock

WHAT DO I DO ?

1. From the Home screen, press ▶ EDIT; then press ▼ 6 times.
2. Press ▶ SET TIME AND DATE.
3. Press ▶ TIME.
4. Press ▶ HOUR; then press ▲ or ▼ until the proper hour is displayed. Be sure that AM/PM setting is correct.

Step 4

5. Press ▶ MINUTE; then press ▲ or ▼ until the correct minute is displayed.
6. Press ▶ SAVE.
7. Press ▶ DATE.
8. MONTH is displayed; then press ▲ or ▼ until the month you want is displayed.
9. Press ▶ DATE; then press ▲ or ▼ until the correct day of the month is displayed.
10. Press ▶ YEAR; then press ▲ or ▼ until the correct year is displayed.
11. Press ▶ SAVE.



Steps 8-11

12. Press ▶ DAY; then press ▲ or ▼ until the correct day of the week is displayed.
13. Press ▶ SAVE.

Step 12

14. Press ▶ EXIT; then press ▲ 6 times and then ▶ EXIT to return to the Home screen.

3.18 Set Astro Clock

Configure Astro Clock for automated sunrise and sunset activation.

WHAT IS IT?

You must enter the latitude, longitude, and time zone coordinates of the controller site, if you want the controller to execute timers in Astro Time.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT; then press ▼ 7 times.
2. Press ▶ SET ASTRO CLOCK to access the Astro Clock screen. (See Figure 3.12.)

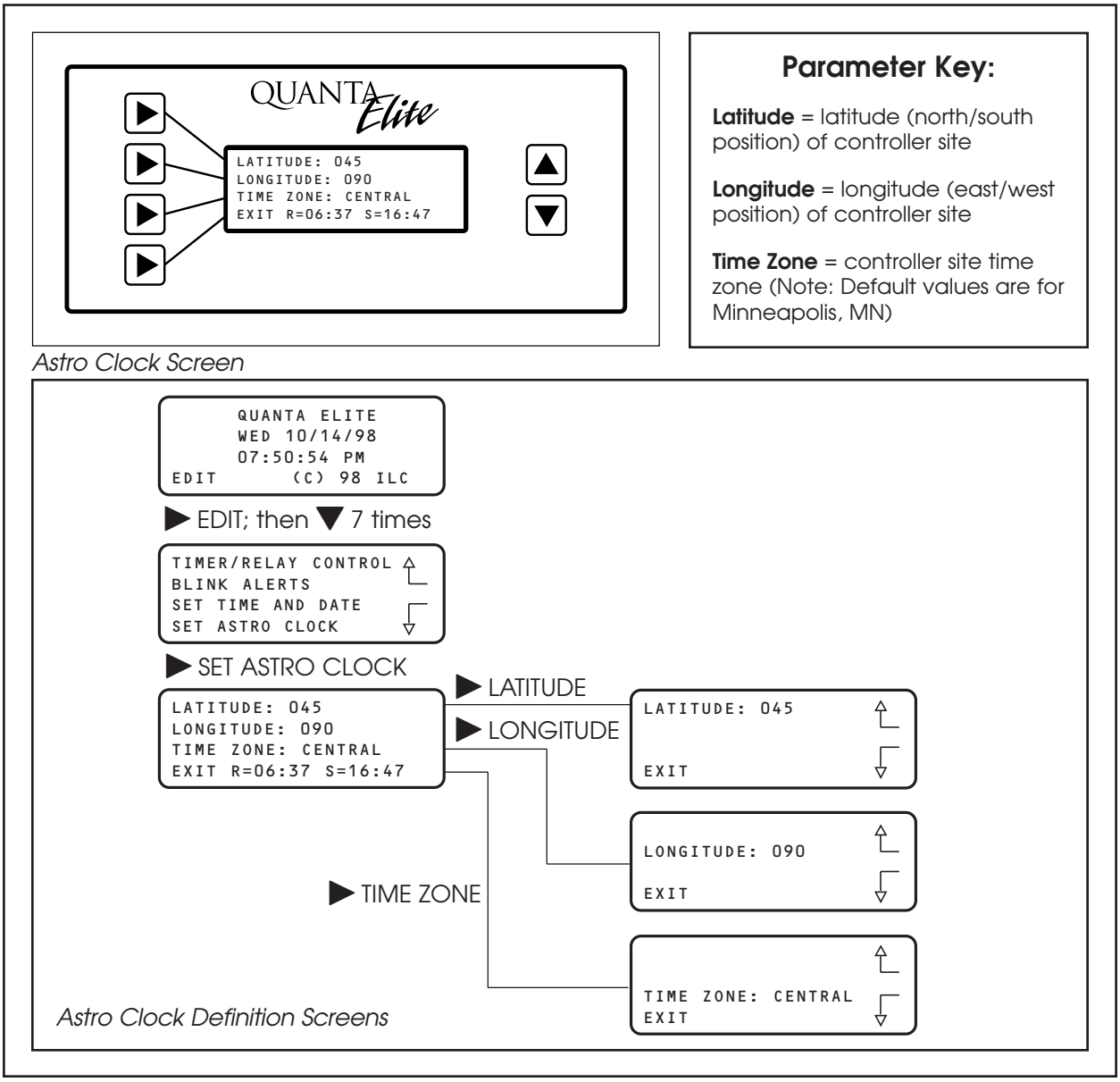


Figure 3.12

3.18 Set Astro Clock

Configure Astro Clock for automated sunrise and sunset activation.

WHAT DO I DO?

1. Press ▶ LATITUDE; then press ▲ or ▼ until the proper latitude appears.

Step 1

2. Press ▶ LONGITUDE; then press ▲ or ▼ until the proper longitude appears.

Step 2

3. Press ▶ TIME ZONE; then press ▲ or ▼ until the proper time zone appears. (Note that the current sunrise and sunset times for the entered coordinates are also displayed on the screen.)

Step 3

4. Then press ▶ EXIT to save the entries.

3.19 Daylight Savings Time

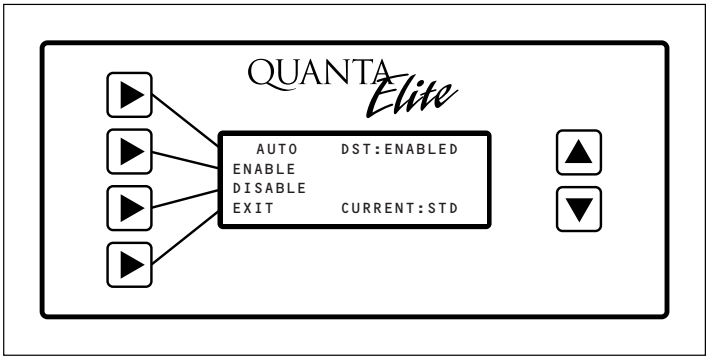
Enable or disable automatic Daylight Savings Time adjustments.

WHAT IS IT?

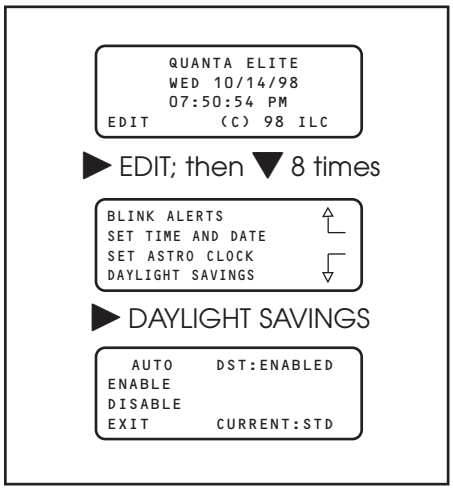
The QUANTA Elite controller supports automatic adjustment of the system clock for Daylight Savings Time. The default is for automatic adjustment between Standard and Daylight Savings on the currently established dates. If the controller is installed in an area where Daylight Savings Time is not implemented, you can disable this feature.

HOW DO I GET THERE?

1. To disable Daylight Savings Time, from the Home screen, press ▶ EDIT.
2. Then press ▼ 8 times and then ▶ DAYLIGHT SAVINGS to access the Daylight Savings screen. (See Figure 3.13.)



Daylight Savings Screen



Daylight Savings Definition Screens

Figure 3.13

3.19 Daylight Savings Time

Enable or disable automatic Daylight Savings Time adjustments.

WHAT DO I DO?

1. Press ▶ DISABLE to disable Daylight Savings Time implementation; or if Daylight Savings is currently disabled and you want to enable it, press ▶ ENABLE. (Note that the screen displays whether controller is Daylight Savings or Standard Time current.)

2. Press ▶ EXIT to save the data and leave the screen.

Steps 1&2

3.20 Serial Interface

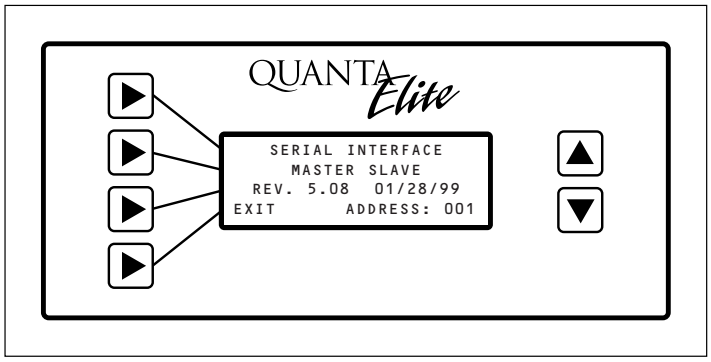
View and edit Serial Interface properties. (See Appendices for specific programming and operating instructions.)

WHAT IS IT?

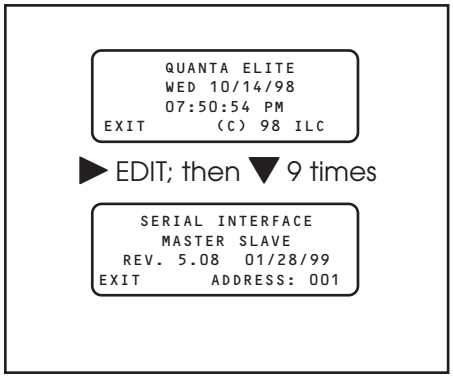
This feature displays the current communications firmware and the controller's node address. In certain non-ILC protocols, it also allows you to edit certain communications parameters.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT; then press ▼ 9 times. (See Figure 3.14.)
2. Press ▶ SERIAL INTERFACE.



Serial Interface Screen



Serial Interface Definition Screens

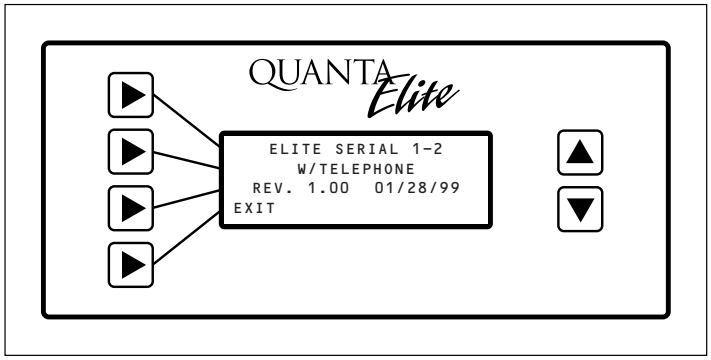
Figure 3.14

3.21 Telephone Interface

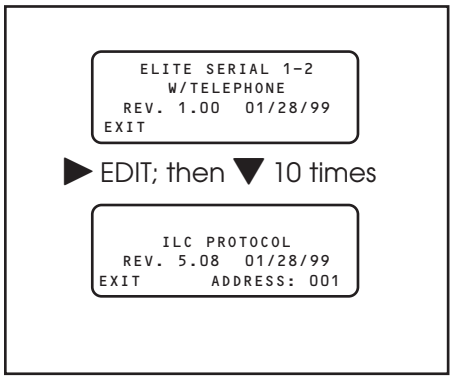
View the current Telephone Interface properties. (See Appendix A for specific programming and operating instructions.)

WHAT IS IT?

This feature permits you to view and edit telephone interface parameters. If your controller is equipped with this feature, see Appendix A.



Telephone Interface Screen



Telephone Interface Definition Screens

Figure 3.15

3.22 DMX Receiver

View and edit DMX interface properties (see appendices for specific programming and operating instructions).

WHAT IS IT?

This feature allows you to view and edit DMX parameters. If your controller is equipped with this feature, see Appendix D.

3.23 Panel Name

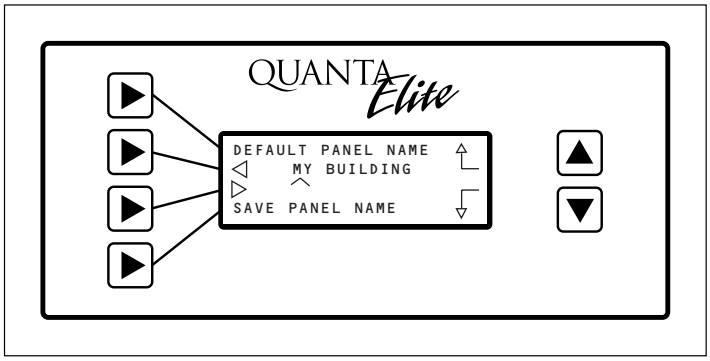
View and edit panel name.

WHAT IS IT?

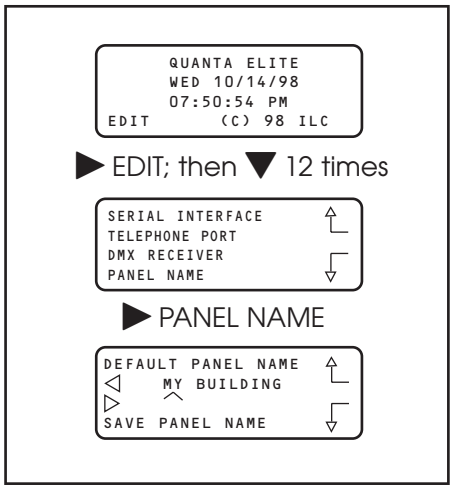
If you choose, you can customize the QUANTA Elite controller (panel) name. The controller name appears at the top of the Home screen.

HOW DO I GET THERE?

1. From the Home Screen, press ▶ EDIT; then ▼ 12 times;
2. Then press ▶ PANEL NAME to access the Panel Name screen. (See Figure 3.16.)



Panel Name Screen



Panel Name Definition Screens

Figure 3.16

3.23 Panel Name

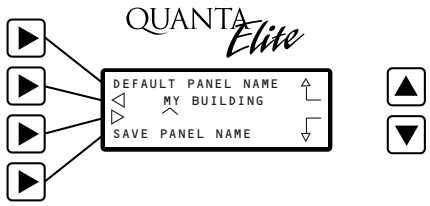
View and edit panel name.

WHAT DO I DO?

1. Press ◀ ; then press ▶ to move the cursor to the first position you want to place the first letter, number, or symbol of the panel name.

2. Then press ▲ or ▼ until the alpha numeric appears. Repeat this process until you have entered the panel name on the screen.

3. Press ▶ SAVE PANEL NAME to load the name into the controller memory. (Note: You can press ▶ DEFAULT PANEL NAME, then ▶ SAVE PANEL NAME, if you want to delete a customized panel name and re-instate the default name (QUANTA Elite)).



Steps 1, 2, 3

3.24 Edit Presets

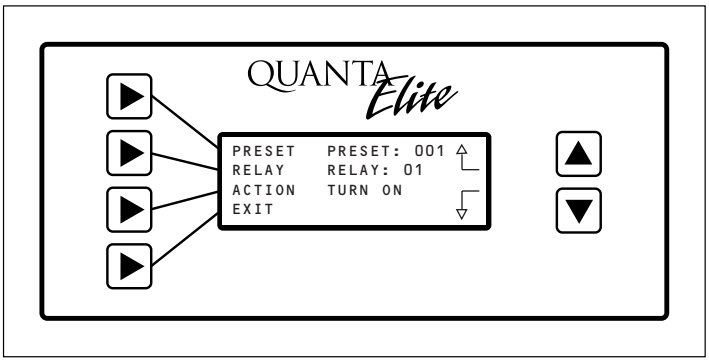
Edit or create preset scenes for activation.

WHAT IS IT?

You can change any of the captured presets using this feature. You can change any or all of the relay ON/OFF states that make up a selected preset.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT.
2. Press ▼ 13 times.
3. Then press ▶ EDIT PRESETS to access the Edit Presets screen. (See Figure 3.17.)



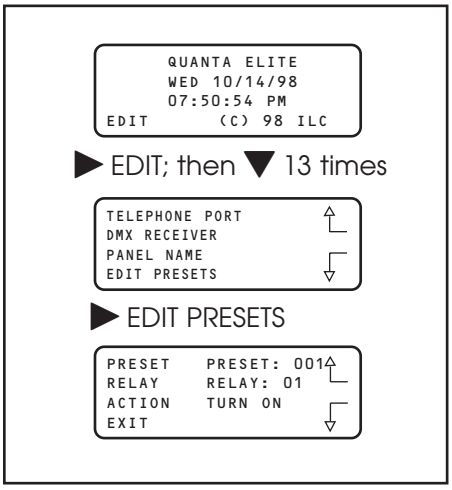
Edit Presets Screen

Parameter Key:

PRESET = the number of the preset you want to edit

RELAY = the number of the relay output whose ON/OFF state you want to change

ACTION = the desired response of the relay to the TEST (See 3.25.) command: NO ACTION, TURN ON, or TURN OFF



Edit Presets Definition Screens

Figure 3.17

3.24 Edit Presets

Edit or create preset scenes for activation.

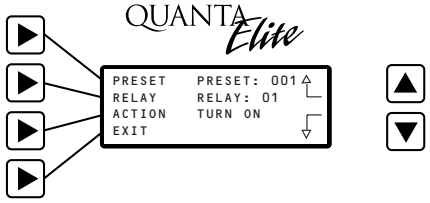
WHAT DO I DO?

1. Press ▶ PRESET; then press ▲ or ▼ until the preset you want to edit appears on the screen.

2. Press ▶ RELAY; then ▲ until the relay whose ON/OFF state you want to change appears.

3. Press ▶ ACTION; then ▲ or ▼ until the desired state appears.

4. After you have edited all the relays to be changed, press ▶ EXIT to save the changes and leave the screen.



Steps 1, 2, 3

3.25 Capture Preset

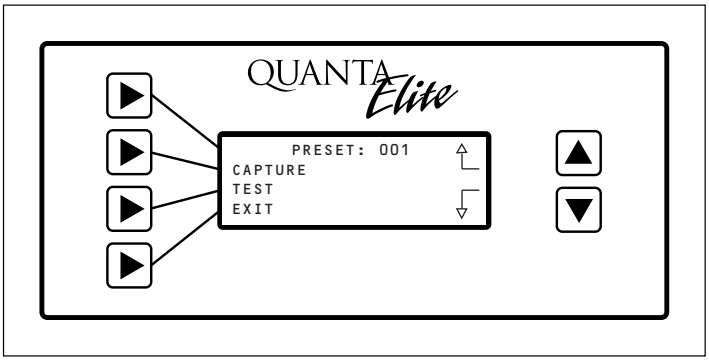
Capture current output relay status and store as a preset scene.

WHAT IS IT?

The QUANTA Elite supports the ability to save the current states of the relay outputs. You can use this stored information to set the relay outputs to the same pre-determined states anytime in the future. You can capture up to 256 presets.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT.
2. Then press ▼ 14 times to access the Capture Preset screen. (See Figure 3.18.)



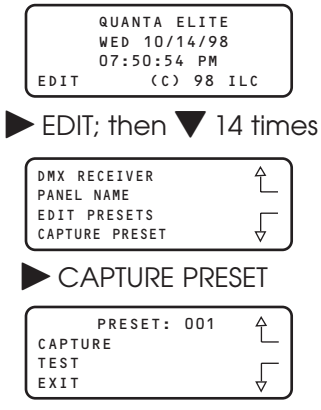
Capture Preset Screen

Parameter Key:

PRESET = the number you assign to a set of relay ON/OFF states that you have commanded the controller to capture

CAPTURE = the command to save the current relay ON/OFF states

TEST = the command to set the relays to the preset states.



Capture Preset Definition Screens

Figure 3.18

3.25 Capture Preset

Capture current output relay states and save them as a preset scene.

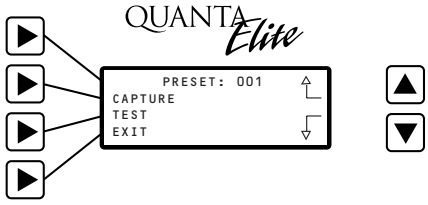
WHAT DO I DO?

1. Press ▲ to select a number for the PRESET.

2. Press ▶ CAPTURE; the controller will store the ON/OFF states of each relay output.

3. Press ▶ EXIT to leave the screen.

Later, after timers or switch signals have changed the relay outputs from the captured states, you can access the Capture Relay screen again, select the appropriate PRESET, then press ▶ TEST. The controller will set the relay outputs to that preset's states.



Steps 1, 2, 3

3.26 Set Open/Close Times

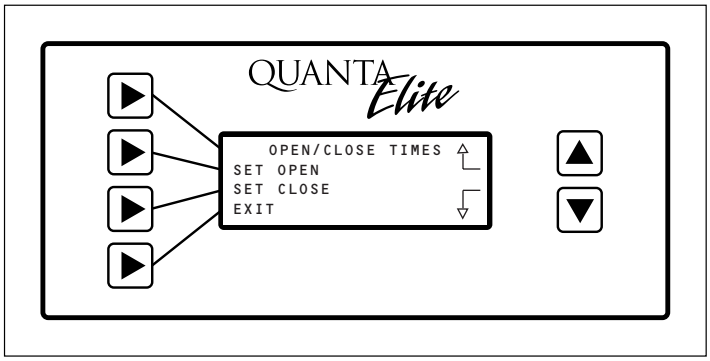
Set Open and Close activation times.

WHAT IS IT?

This feature allows you to define timers in relation to the Open and Close Times of the store. You first enter the Open and Close Times. Then define one timer to occur keyed to opening and a second timer keyed to the store close time. You can program the controller to execute the timer exactly at Open or Close Time or at one of the following offsets either before or after opening or closing: 5, 10, 15, 30, 45 minutes; 1, 1.5, 2, 3, 4, 4.5, 5 hours.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT.
2. Then press ▼ 15 times to access the Set Open/Close Times screen. (See Figure 3.19.)

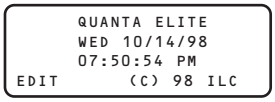


Set Open/Close Time Screen

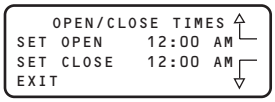
Parameter Key:

SET OPEN = the time you assign for store open

SET CLOSE = the time you assign for store close



▶ EDIT; then ▼ 15 times



Set Open/Close Time Definition Screens

Figure 3.19

EXAMPLE – PART 1

Program the controller to turn on lights 15 minutes before the store opens and turn them off 15 minutes after the store closes. In this example, the store hours are 9 AM to 9 PM.

3.26.1 Set Open/Close Times

Set facility Open and Close activation times.

1. From the Home screen, press ▶ EDIT; then ▼ 15 times.

2. Press ▶ SET OPEN/CLOSE TIMES.

3. Press ▶ SET OPEN; then press ▶ HOUR.

4. Press ▲ or ▼ until 09: appears. Be sure that AM also appears on the screen.

5. Press ▶ MINUTE; then ▲ or ▼ until 00 appears. Now you have set the Open Time to 09:00 AM.

6. Press ▶ EXIT to return to the top level screen.

7. Press ▶ SET CLOSE and set the Close Time at 9:00 PM.

8. Press ▶ EXIT to return to the menu screens.

Steps 3 – 5

After Step 7

EXAMPLE – PART 2

Program the controller to turn on lights 15 minutes before the store opens and turn them off 15 minutes after the store closes. In this example, the store hours are 9 AM to 9 PM. Open/Close times were defined in the example in 3.26.1. The next step is to assign timers to those Open/Close times. Since these timers are based on the Open/Close times, they will change along with a change in store hours without having to reset them.

3.26.2 Define the Timers

Assign specific timers to the Open/Close Times previously defined.

1. From the Home screen, press ▶ EDIT; then, press ▼ 3 times.

2. Press ▶ TIMERS to access the top level Timer Definition screen.

3. Press ▲ until the timer you wish to key to the store opening time appears (in this example, TIMER: 02).

4. Press ▶ TIME; then press ▶ OPEN/CLOSE.

5. Press ▶ OPEN; then ▼ until OPN-15 MN appears.

6. Press ▶ EXIT to return to the top level Timer Definition screen.

7. Press ▲ until the timer you wish to key to the store close time appears (in this example TIMER: 03).

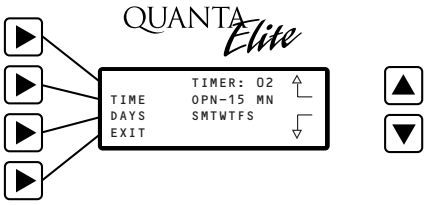
8. Press ▶ TIME; then press ▶ OPEN/CLOSE.

9. Press ▶ CLOSE; then ▼ until CLS+15 MN appears.

10. Press ▶ EXIT to return to the top level Timer Definition screen. Then ▶ EXIT again to return to the menu screens.

Top Level Timer Definition Screen (Step 2)

Time Setting Screen (Step 3)



Top Level Timer Definition Screen (Step 6)

EXAMPLE – PART 3

Program the controller to turn on lights 15 minutes before the store opens and turn them off 15 minutes after the store closes. In this example, the store hours are 9 AM to 9 PM. Open/Close times were defined in the example in 3.26.1. The Timers were defined in 3.26.2. The next step is to map relays controlling the desired lighting circuits to those timers.

3.26.3 Map the Lighting Relays to the Timers

1. From the Home screen, press ▶ EDIT; then ▼ 4 times.

2. Press ▶ TIMER/RELAY CONTROL to access the top level Control Definition screen.

3. Press ▶ TIMER until TIMER: 02 appears.

4. If necessary, press and **HOLD** ▶ RELAY; then ▲ until a node (controller) containing relays controlling level 3 circuits appear. Then press ▶ OK to return to the top level Control Definition screen.

5. Press ▶ RELAY; then ▲ until the first relay to be controlled appears.

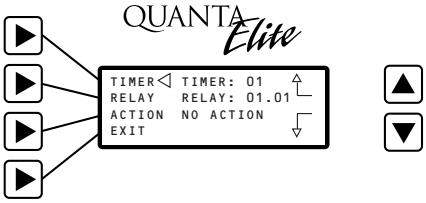
6. Press ▶ ACTION; then ▲ until TURN ON appears.

7. Repeat steps 5 and 6 as required until you have defined all the relays turned on by TIMER: 02.

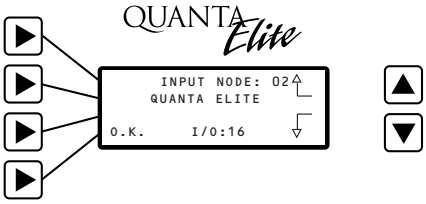
8. Press ▶ TIMER; then ▲ until TIMER: 03 appears.

9. Repeat steps 5 to 7 except that you select TURN OFF for the relay action.

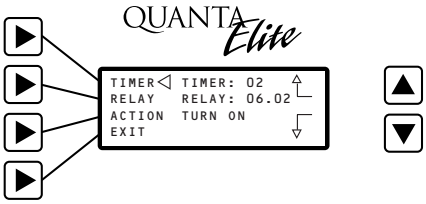
10. Repeat steps 4 to 9 as required to define level 3 relays located in other controllers.



Top Level Timer/Relay Control Definition Screen (Step 2)



Node Selection Screen (Step 4)



Top Level Screen (After Step 6)

3.27 Firmware Revision

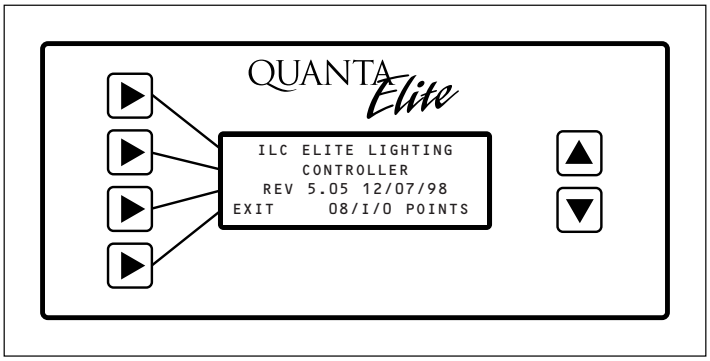
View revision of firmware installed in unit.

WHAT IS IT?

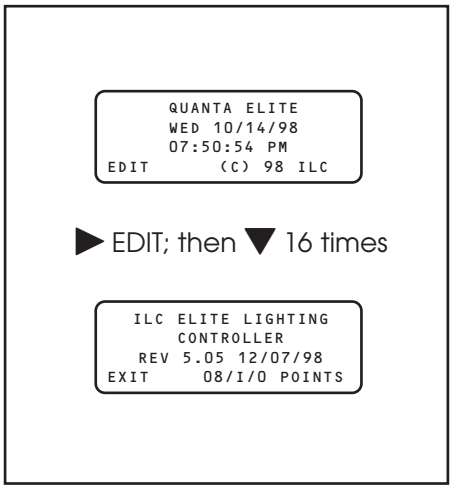
This feature allows you to view the version of firmware currently installed in the controller. It also displays the number of I/O points in the controller.

HOW DO I GET THERE?

1. From the Home screen, press ▶ EDIT.
2. Then press ▼ 16 times to access the Firmware Revision screen. (See Figure 3.20.)



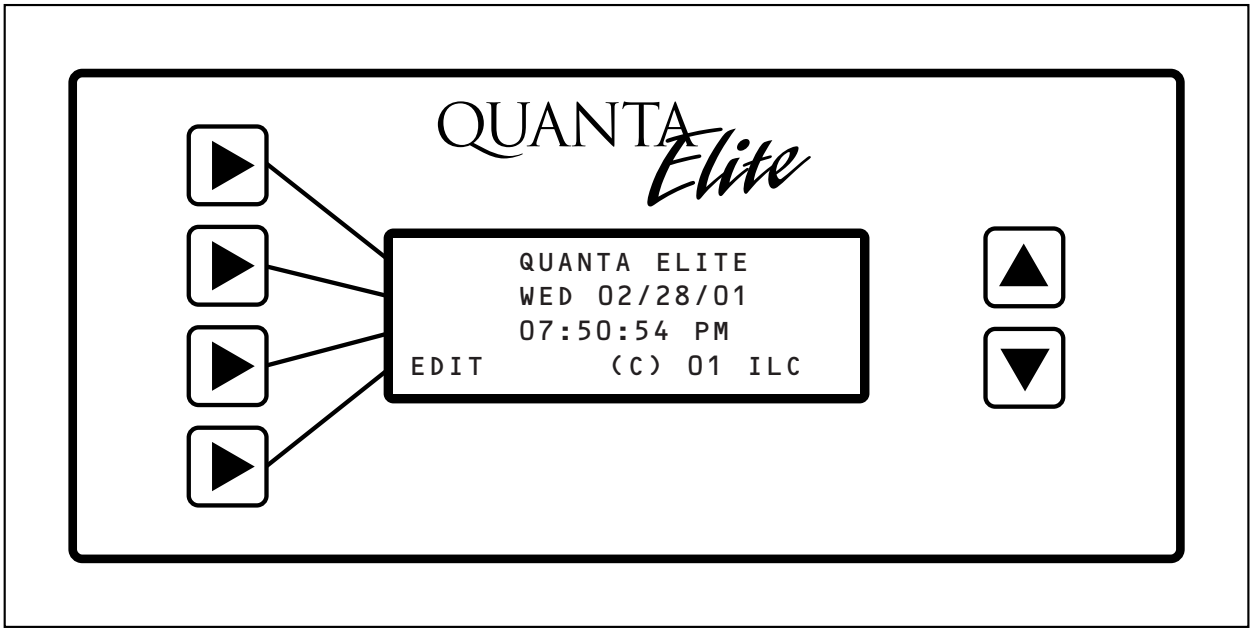
Firmware Revision Screen



Firmware Revision Definition Screens

Figure 3.20

Section 4
Appendix



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The FCC requires that the following statement be included in this manual.
FCC Registration #6TP USA-35522-DM-N
Ringer Equivalence 0.4B

Connecting to the telephone company

This equipment complies with Part 68 of the FCC rules. On the back plate near the RJ 11 jack of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence (REN) for this equipment. If requested, provide this information to your telephone company.

The REN is useful to determine the quantity of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in devices not ringing in response to an incoming call. In most, but not all areas, the sum of RENs of all devices should not exceed five (5). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company.

If your telephone equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance isn't practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC if you believe it is necessary.

Your telephone company may make changes in your facilities, equipment, operations, or procedures that could affect he operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

If you experience trouble with this telephone equipment, please contact: Intelligent Lighting Controls, Inc./Reliant Relay Co., Technical Support Department at 1-800-922-8004 for repair and warranty information. If your equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

This equipment may not be used on public coin service provided by the telephone company. Connection to party lines is subject to state tariffs. (Contact your local state public utility commission or corporation commission for information.)

NOTICE: The Industry Canada label identifies certain equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Industry Canada does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local t elecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line of individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designed by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

A.1 Overview

The telephone Add-On Module is an optional board that is easily added to the QUANTA Elite controller. This module supports either remote modem programming and control or dual tone multi-frequency (DTMF) touch-tone telephone control and monitoring. The module plugs into either of the expansion slots provided on the QUANTA Elite controller CPU I/O board. (See Figure A-1.)

The telephone Add-On Module can automatically switch between remote modem and DTMF control.

A.2 Telephone Control Features

The Add-On module supports the following touchtone telephone control features:

- Get the current status of the controller's relay outputs
- Turn ON or OFF single relays or groups of relays
- Get the current status of the controller's switch inputs
- Activate preset scenes
- Override timer events

DTMF commands and control functions are supported by voice prompts that guide you through operational commands and give you instructions on how to use the system.

A.3 Telephone Control Setup

1. If you are field-installing the module, power-down the controller and plug the module into an unused expansion slot on the controller CPU I/O board. (See Figure A-1.)
2. Connect a phone cord to the module RJ11 jack and connect the other end to the telephone outlet. **The telephone line must be an analog line and have its own phone number. The line must be direct and not switched through a PBX or any type of extension system.**
3. Dial the telephone number of the controller.
4. When the controller answers, follow the voice prompts that will guide you through the operations you can perform.

A.4 Remote Modem Programming Control and Monitoring

You can link a personal computer (PC) equipped with a modem and QUANTA Pro networking software to the QUANTA Elite controller and perform all the control and programming operations supported by Quanta Pro including:

- Check the status of the controller's relay outputs and switch inputs
- Turn ON/OFF individual relay outputs
- Sweep ON/OFF all the relay outputs
- Define switch inputs and map them to relay outputs
- Define timers and map them to relay outputs
- Define and invoke preset scenes
- Upload and download data between the controller and your PC.

A.5 Remote Modem Control Setup

1. If you are field-installing the module, power-down the controller and plug the module into an unused expansion slot on the controller CPU I/O board. (See Figure A-2.)
2. Connect a phone cord to the module RJ11 jack and connect the other end to the telephone outlet. **The telephone line must be an analog line and have its own phone number. The line must be direct and not switched through a PBX or any type of extension system.**
3. Using QUANTA Pro, dial the controller phone number.
4. When your PC and the controller link, perform the desired QUANTA Pro operations.

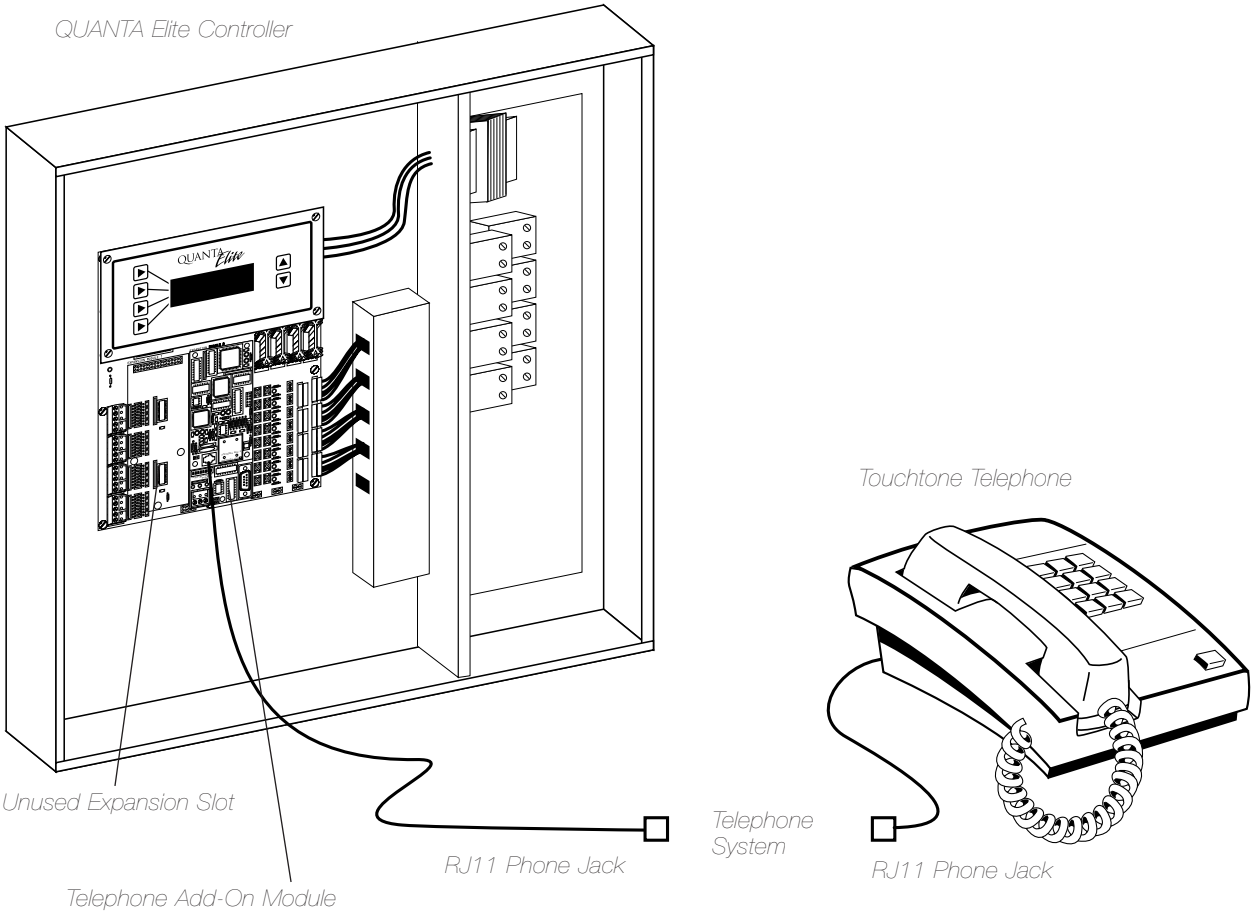


Figure A.1 – DTMF Phone Control

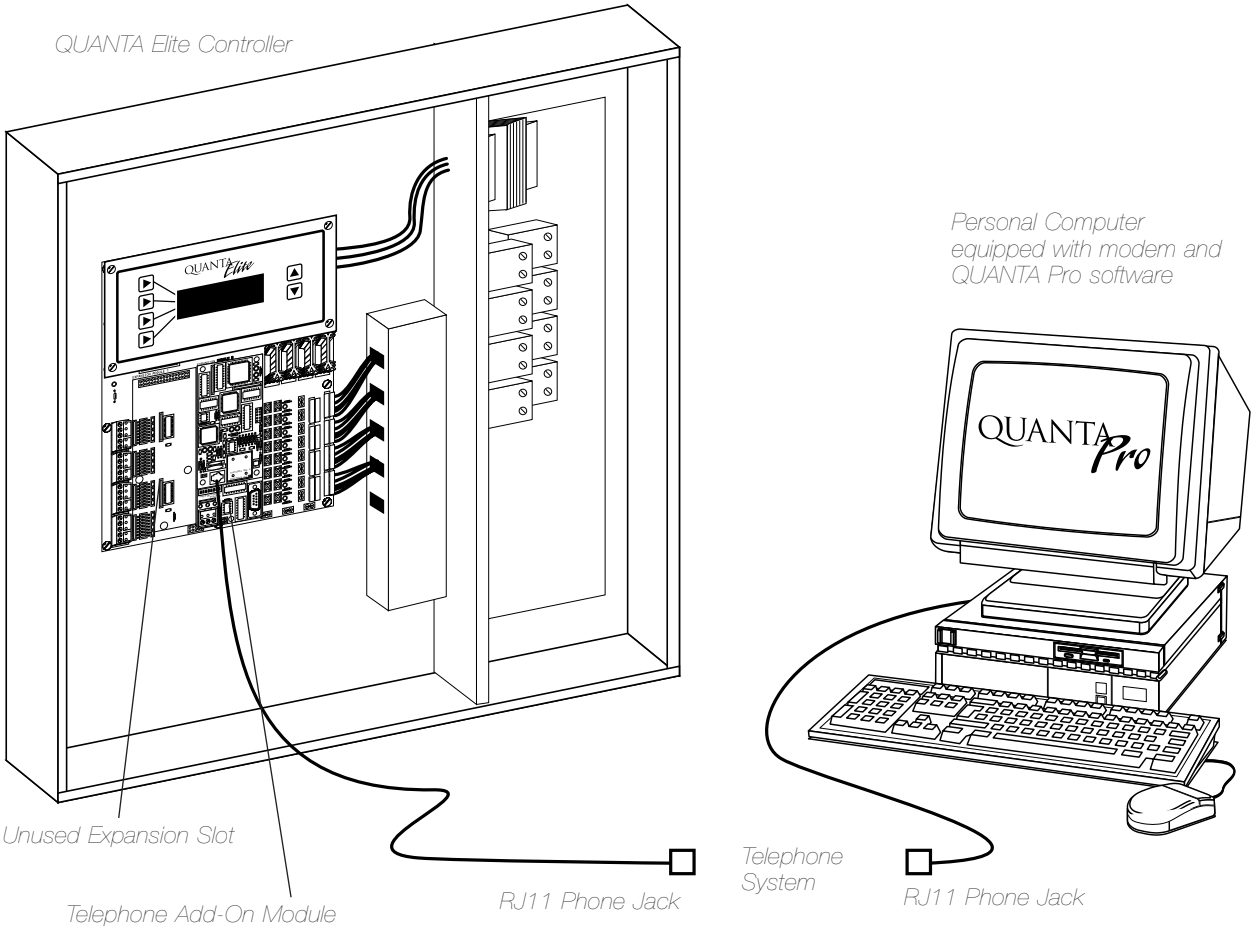


Figure A.2 – Remote Modem Control

B.1 Overview

The PC Add-On Module allows you to program the QUANTA Elite controller using a personal computer (PC) equipped with QUANTA Pro software. **Consult the QUANTA Pro User Manual for installation and operating instructions**.

The minimum requirements for the computer are:

- IBM compatible PC
- 486DX 66 or faster (Pentium recommended)
- 1 RS232 serial port
- CD-ROM or CD-ROM R/W drive
- Windows 95, 98 or newer
- 8 MB RAM
- VGA or SVGA monitor: 640 x 480 min; 800 x 600 recommended
- Mouse & keyboard

With QUANTA Pro you can:

- Check the status of the controller's relay outputs and switch inputs
- Turn ON/OFF individual relay outputs
- Sweep ON/OFF all the relay outputs
- Define switch inputs and map them to relay outputs
- Define timers and map them to relay outputs
- Define and invoke preset scenes
- Upload and download data between the controller and your PC.

B.2 PC Add-On Setup

1. If you are field-nstalling the module, power-down the controller and plug the module into an unused expansion slot on the controller CPU I/O board. (See Figure B-1.)
2. Connect the factory supplied RS232 cable to the module port and connect the other end to the COM port you have selected for communication on your computer.
3. Using QUANTA Pro, connect with the controller.
4. When your PC and the controller link, perform the desired QUANTA Pro operations.

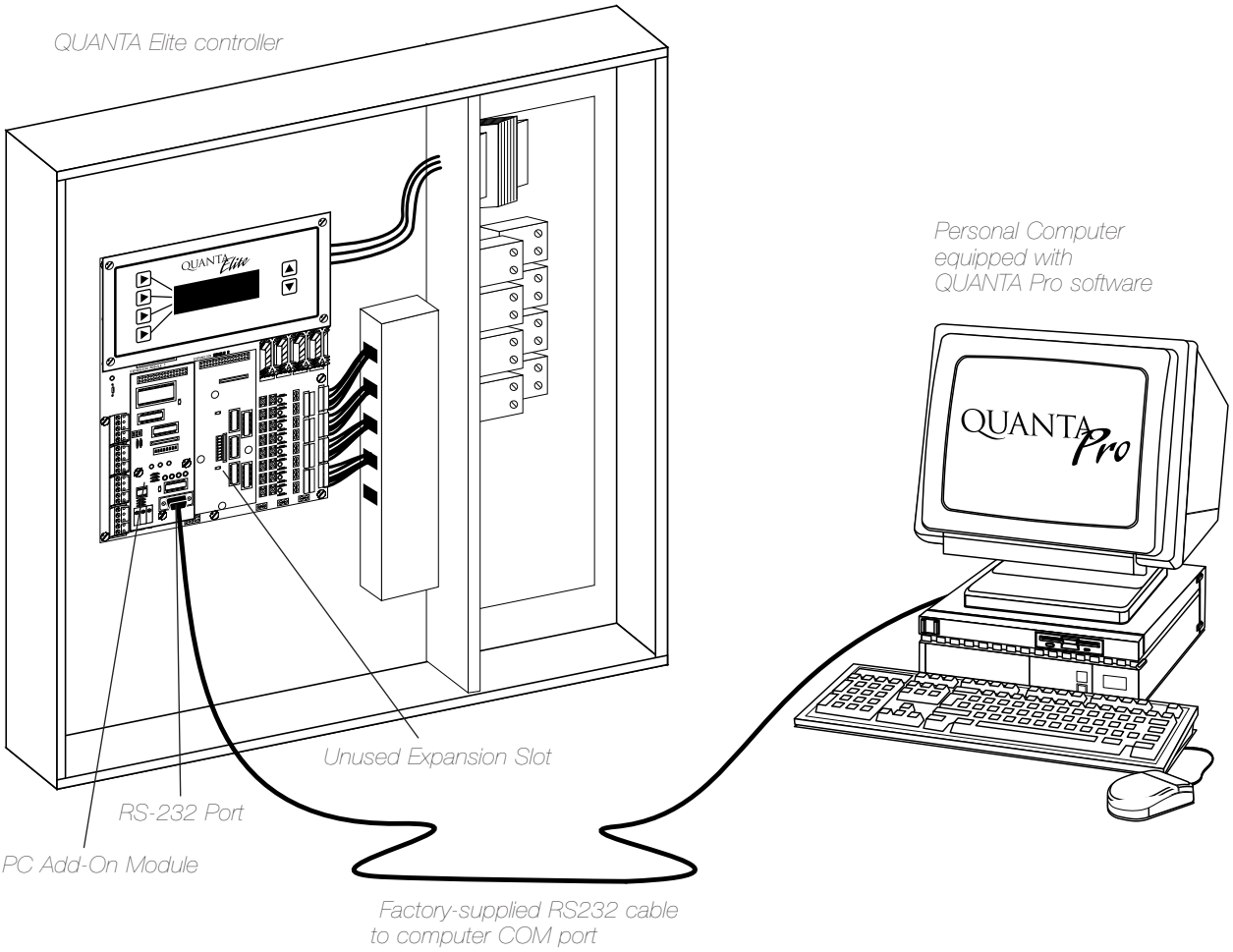


Figure B.1 – Programming the Controller from a PC

C.1 Overview

You can link up to 256 Quanta controllers to form a LAN (Local Area Network). Switches and timers can control relay outputs in any of the controllers regardless of the location of the physical switch. You program all functions and I/O points from the master controller programming module.

C.2 Setup

Each controller in the LAN will come factory equipped with the required networking firmware and a Serial/LAN Module which is mounted on the CPU/I/O board. (See Figure C-1). Make sure the position of the protocol select jumpers on the Serial/LAN Module are in the proper Master/Slave Networking position. Also note the address DIP switches. Each controller in the LAN must have a unique address. The Quanta you choose as the master **MUST** be controller **1**. To set a controller address, set the switches so that when you add the values of each switch set to the ON position, the total will be the desired address.

C.3 Installation

Install each Quanta controller per the instructions in Section 2. The LAN physical link is cable **(Carol 2534 or equal; contact ILC for cable specifications)** connected to the RS485 port on the Serial/LAN Module. (See Figure C-1.) The master controller can be installed anywhere in the chain as long as you address it as controller 1.

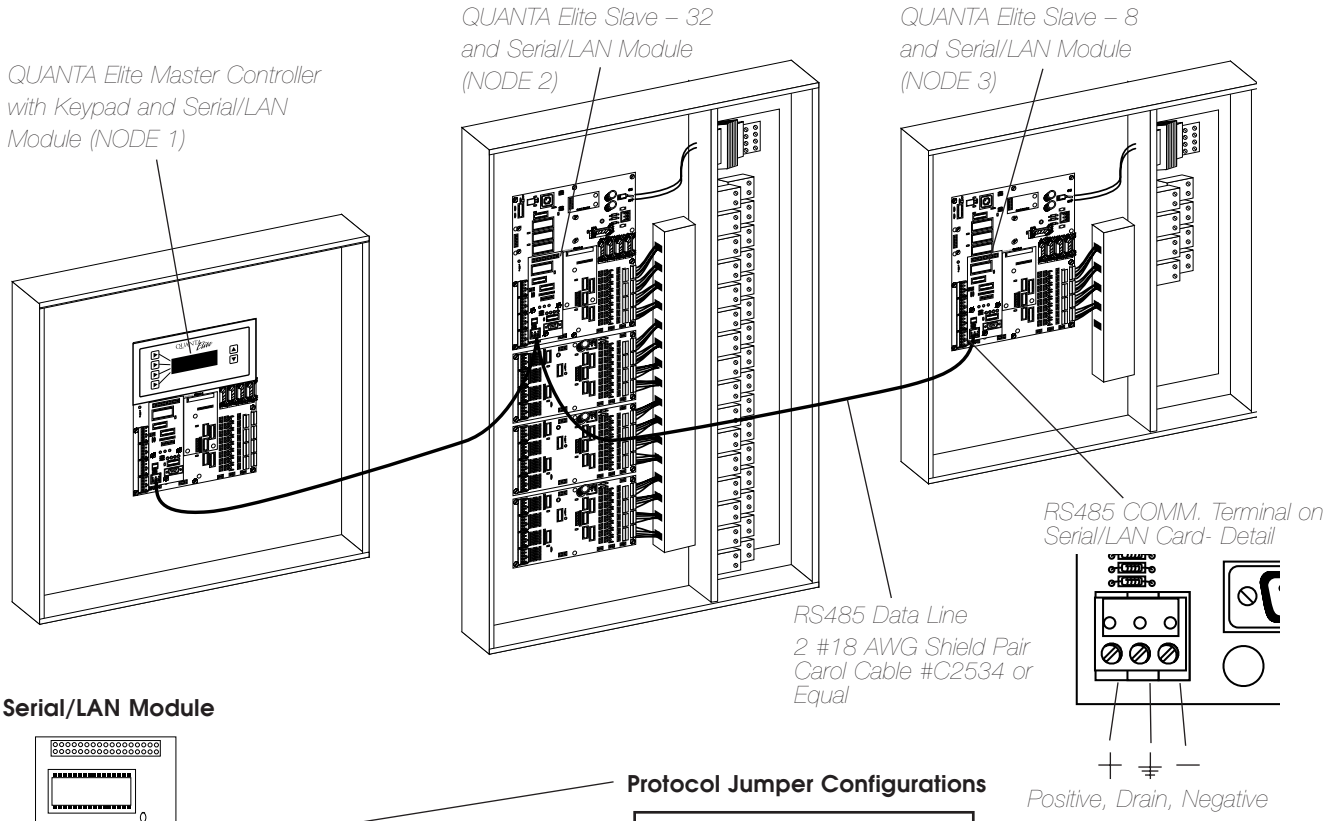
CAUTION

AFTER INSTALLATION, VERIFY THAT THE CABLING IS FREE OF SHORTS BETWEEN CONDUCTORS AND GROUND AND ALSO THAT THERE ARE NO OPENS. SHORTS CAN DAMAGE THE NETWORK.

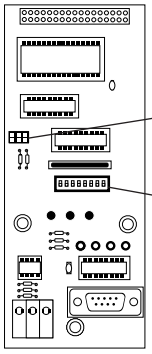
C.4 Power-Up

1. Power-up each of the **slave** controllers one at a time following the instructions in Section 2. ***DO NOT POWER-UP THE MASTER YET.*** Do not attempt to program the slave controllers; you will do the programming at the master controller after power-up.
2. After all slave controllers are powered-up, power-up the master controller. A message indicating that the master is scanning the network will appear on the screen. Then the transmit, receive, and drive LEDs on the master controller's Serial/LAN Module will start blinking and the Home screen will appear.
3. Verify that the transmit, receive, and drive LEDs are blinking on each of the slave controller networking cards.
4. Set the date and time at the master. (See Section 3 for details.) Setting the clock at the master will set the clocks of the slave controllers.
5. Program the switch, timer and other functions. Program the functions is as described in Section 3, except that you will have to select the controller address (node) as an additional parameter.
6. After programming the switch and timer functions, verify them as described in Section 2.

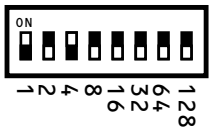
QUANTA Elite Global Network Example – See Termination Detail Below


QUANTA Elite Master Controller with Keypad and Serial/LAN Module (NODE 1)
QUANTA Elite Slave – 32 and Serial/LAN Module (NODE 2)
QUANTA Elite Slave – 8 and Serial/LAN Module (NODE 3)
RS485 COMM. Terminal on Serial/LAN Card- Detail
RS485 Data Line
2 #18 AWG Shield Pair
Carol Cable #C2534 or Equal
Positive, Drain, Negative

Serial/LAN Module

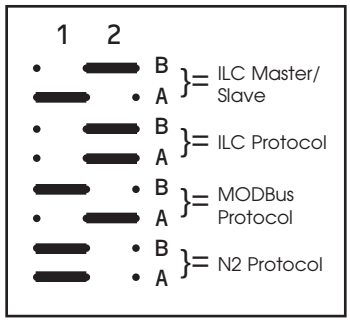


DIP Switch Addressing



Add the value of each ON switch to determine the address (address 5 shown).

Protocol Jumper Configurations



WARNING:
Processor must be turned OFF before protocol jumper changes.

Termination Detail – Connections to Serial/LAN Card With RS485 Data Cable

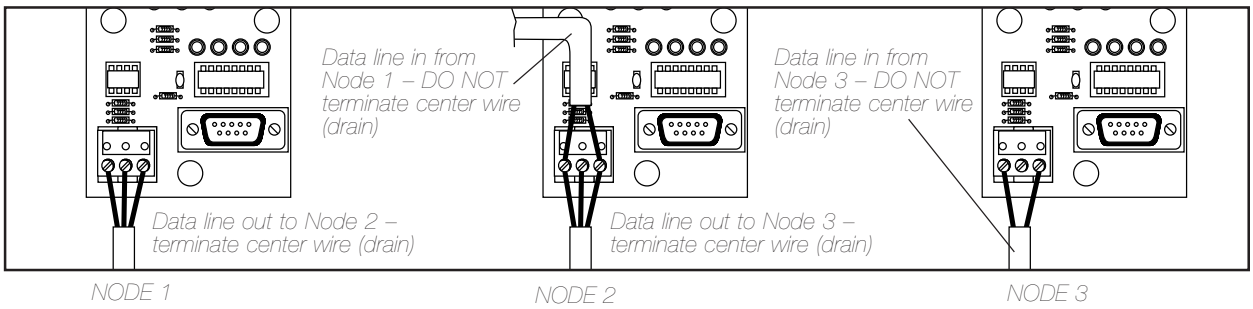

Data line in from Node 1 – DO NOT terminate center wire (drain)
Data line in from Node 3 – DO NOT terminate center wire (drain)
Data line out to Node 2 – terminate center wire (drain)
Data line out to Node 3 – terminate center wire (drain)
NODE 1
NODE 2
NODE 3

Figure C.1 – LAN Setup

C.5 Programming

You program the entire network from the master controller. The procedures and parameters are the same as described in Sections 1 and 2 except that you need to define the controller number (node) in addition to the other parameters. You do this by pressing and **holding** the appropriate programming module keys.

C.5.1 Example: Program switch input 2 located in controller 4 to control relay output 3 in controller 2.

1. Access the INPUT/RELAY CONTROL screen.

2. Press and **hold** ▶ INPUT until the node selection screen appears.

3. Press ▲ until NODE: 04 appears.

4. Press ▶ O.K. to return to the INPUT/RELAY CONTROL screen.

5. Press ▲ until INPUT: 02 appears.

6. Press and **hold** ▶ RELAY until the node selection screen appears.

7. Press ▲ until NODE: 02 appears.

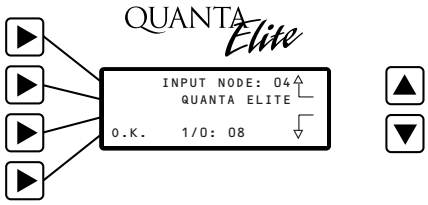
8. Press ▶ O.K. to return to the INPUT/RELAY CONTROL screen.

9. Press ▶ RELAY and then ▲ until RELAY: 03 appears.

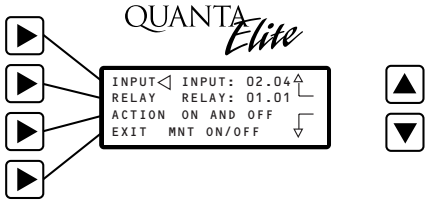
10. Press ▶ ACTION; then ▲ until the desired relay response appears.

11. Press ▶ EXIT to save the data and leave the screen.

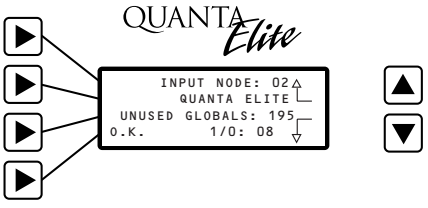
Step 1



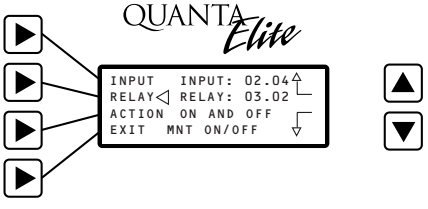
Steps 3-4



Step 5



Steps 7-8



Steps 9-11

D.1 Overview

With the addition of a DMX 512 interface card, the QUANTA Elite controller supports the control of non-dimmed loads via standard USITT DMX 512 communications protocol.

The physical link is a standard USITT DMX 512 control cable (18 gauge, shielded twisted pair) that runs from the DMX output of the theatrical lighting controller to the QUANTA Elite DMX communications port. The DMX 512 interface mounts on the QUANTA Elite CPU board. (See Figure D-1.)

You can program the QUANTA Elite with desired ON and OFF DMX signal levels and then select how the QUANTA Elite relay outputs will respond.

You set common ON and OFF DMX signal levels for all DMX 512 channels (1 to 512 channels). However, you can program relay action on an individual channel basis.

D.2 Objectives

After reading Appendix D, you will be able to program the QUANTA Elite to implement DMX control.

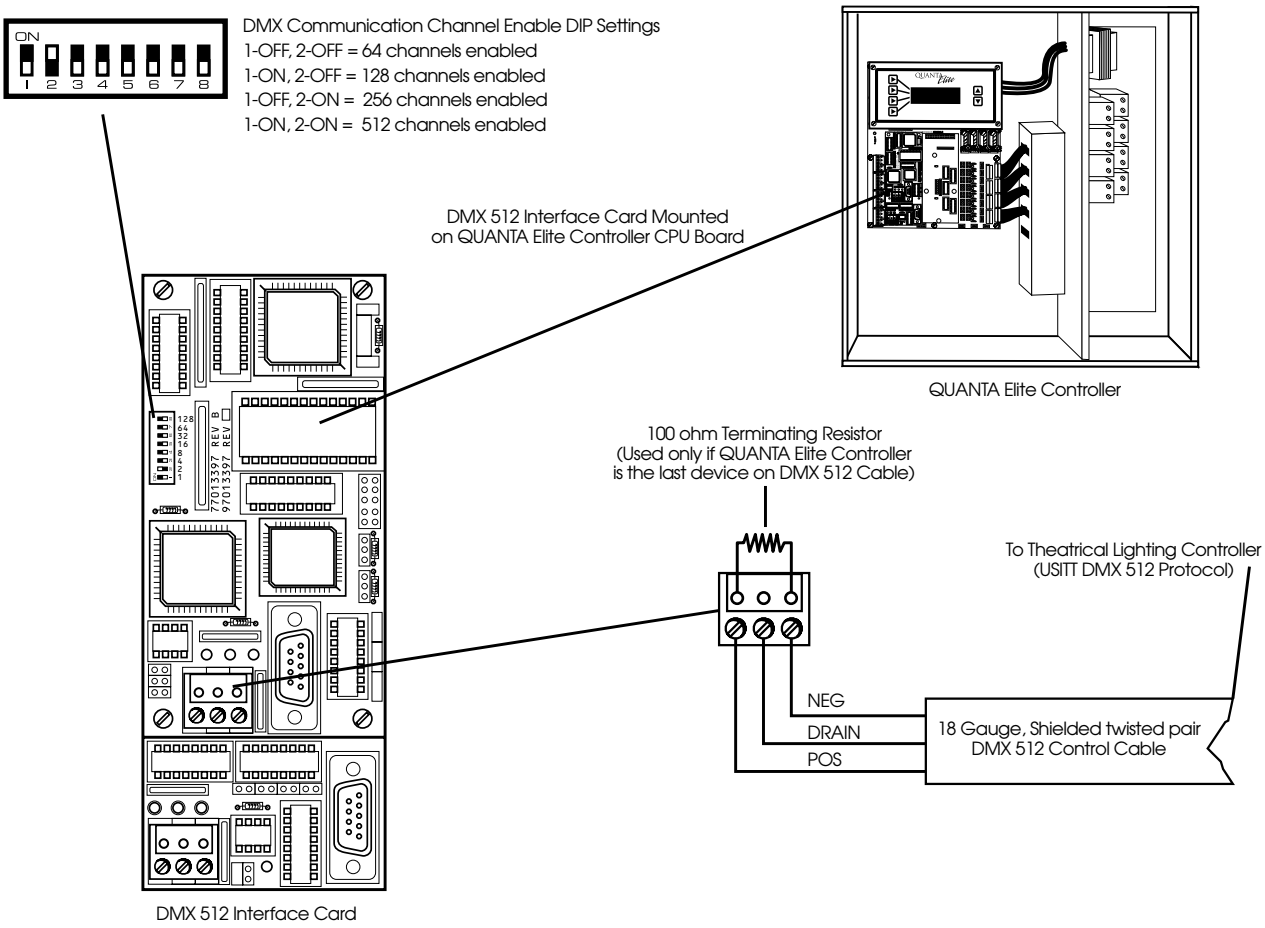

ON
1 2 3 4 5 6 7 8
DMX Communication Channel Enable DIP Settings
1-OFF, 2-OFF = 64 channels enabled
1-ON, 2-OFF = 128 channels enabled
1-OFF, 2-ON = 256 channels enabled
1-ON, 2-ON = 512 channels enabled
DMX 512 Interface Card Mounted
on QUANTA Elite Controller CPU Board
QUANTA Elite Controller
100 ohm Terminating Resistor
(Used only if QUANTA Elite Controller
is the last device on DMX 512 Cable)
To Theatrical Lighting Controller
(USITT DMX 512 Protocol)
NEG
DRAIN
POS
18 Gauge, Shielded twisted pair
DMX 512 Control Cable
DMX 512 Interface Card

Figure D.1 – DMX Interface Hardware Features

D.3 Programming Example

Set the DMX signal ON level at 92% and the OFF level at 15%. Program relay outputs 4, 5, and 6 to respond by switching ON at 92% and OFF at 15% to signals of this amplitude on channel 2.

1. From the Home screen, press ▶ EDIT; then press ▼ 11 times to access the top level DMX screen.

2. Press ▶ EDIT DMX RECEIVER.

3. When the DMX menu appears, press ▶ DMX–LEVELS.

4. Press ▶ ON, then ▲ until 092% appears, to set the ON signal level.

5. Press ▶ OFF, then ▲ or ▼ until 015% appears, to set the OFF level.

6. Press ▶ EXIT to return to the DMX menu.

7. Press ▶ DMX-RELAY CONTROL.

8. Press ▲ until channel 002 appears.

9. Press ▶ RELAY, then ▲ until relay 004 appears.

10. Press ▶ ACTION, until ON AND OFF appears.

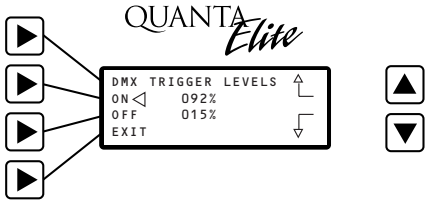
11. Repeat steps 9 and 10 for relays 5 and 6.

12. Press ▶ EXIT to return to the DMX menu.

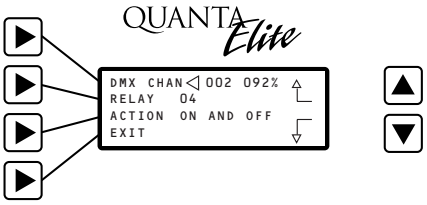
13. Press ▶ EXIT to return to the main menu. Let the controller time out to save your entries and return to the Home screen.

Top Level DMX Screen

DMX Menu



DMX Levels



DMX – Relay Control

E.1 Objectives

This section describes the function and setup of the Master Scheduler and how to program time-based schedules keyed to a facility's multiple open and closed times.

E.2 Overview

This section covers the following topics:

- Master Scheduler description/function
- Programming Operations

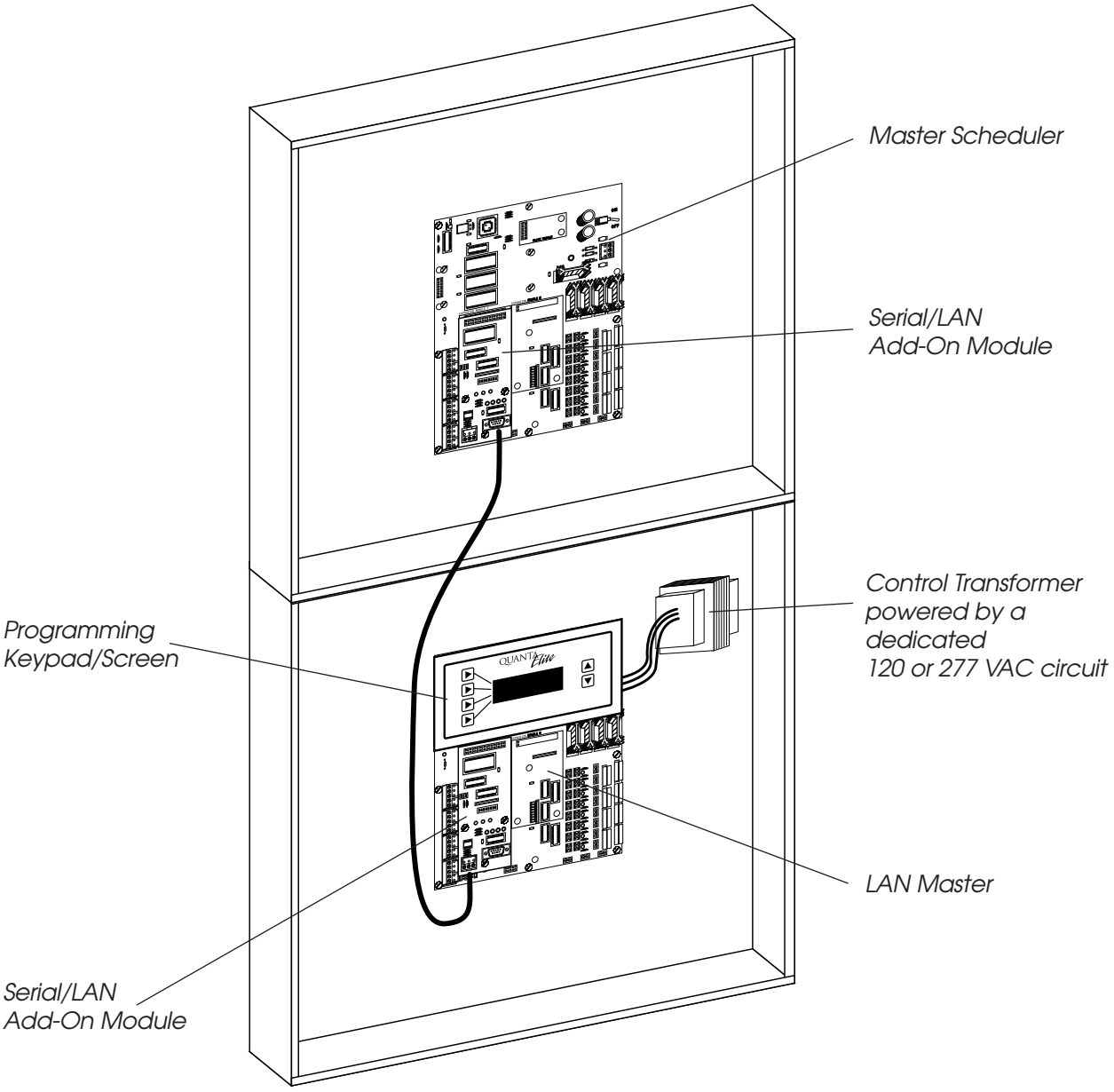


Figure E.1 – Master Scheduler

E.3 Description

The Master Scheduler is a special controller containing a processor whose purpose is to support the entry of multiple OPEN/CLOSE times. (The standard controller firmware supports the entry of only one set of OPEN/CLOSE times.)

The Master Scheduler is usually housed in an enclosure that also contains the LAN Master Controller. (See Figure E-1.)

E.4 Installation

You install the Master Scheduler like any other controller. (See Section 1 and Appendix C.) A dedicated 120 or 277 VAC circuit must be run to power the controller electronics. The node address must be set as node 0.

E.5 How to Program OPEN/CLOSE Time Schedules

The store open and close times define when the lights associated with a particular ON or OFF time will activate. The SCHEDULE MASTER (node 0) processes these times. Since store hours may not be the same on every day, you must define the open and close times for each day (Sunday-Saturday). You can also program open and close times for special dates to accommodate holiday hours.

You can program the system to execute a timer exactly at open or close time, or at one of the following offsets either before or after opening or closing: 5, 10, 15, 30, 45, minutes; 1, 1.5, 2, 3, 4, 4.5, 5 hours.

Example:

Program the control system to turn on lights 15 minutes before the store opens and turn them off 15 minutes after the store closes. In this example the store opens at 10 AM and closes at 9 PM Monday-Friday. The open/close times for Saturday/Sunday are 10 AM and 5 PM.

E.5.1 Set the Open/Close Times

E.5.1a Set the Open/Close Times for Normal Days

1. From the Home screen, press ▶ EDIT; then ▼ 15 times.

2. Press ▶ OPEN/CLOSE TIME.

3. The SCHEDULE MASTER screen appears, showing the current open and close times or the default time of 12:00 AM.

4. Press ▶ EDIT; then press ▶ NORMAL DAYS.

5. The Normal Days screen appears, for Sunday. Press ▶ OPEN; then press ▲ or ▼ until 10:00 AM appears.

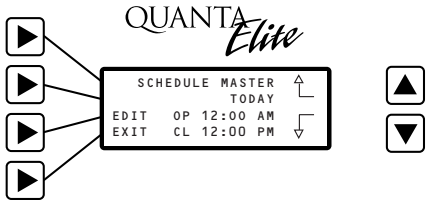
6. Press ▶ CLOSE; then press ▲ or ▼ until 5:00 PM appears.

7. Press ▶ DAY; then press ▲ until MONDAY appears.

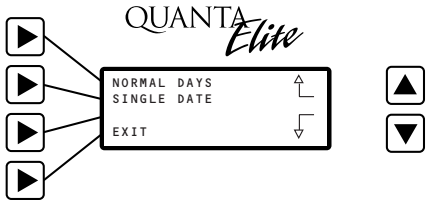
8. Repeat steps 5 & 6 to enter the Monday open and close times of 10:00 AM and 9:00 PM respectively.

9. Repeat steps 7 & 8 to program Tuesday to Saturday open and close times.

10. Let the controller time out, to save your entries.



Step 3, Schedule Master screen



Step 4

Steps 5 and 6 Normal Days screen

E.5.1 Set the Open/Close Times

E.5.1b Set the Open/Close Times for a Single Date

1. From the Home screen, press ▶ EDIT; then press ▼ 15 times.

2. Press ▶ OPEN/CLOSE TIME.

3. The SCHEDULE MASTER screen appears showing the current Open and Close Times or the default time of 12:00 AM.

4. Press ▶ EDIT; then press (SINGLE DATE).
   (Note about Single Date programming: When programming a Single Date, the year is not entered. You must be aware that any time this Single Date occurs (e.g., 4/12), the controller will execute the Open/Close times that you had previously programmed. You must remember to clear the programming before this date occurs the next year if you do not want this Single Date's event to reoccur.)

5. When the top level Single Date screen appears, press ▶ MONTH and then press ▲ or ▼ until the desired month appears.

6. Press ▶ DATE and then press ▲ or ▼ until the desired day of the month appears.

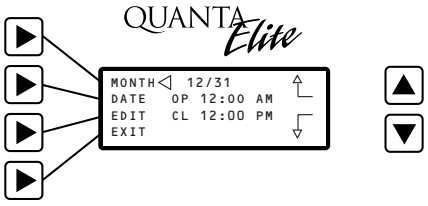
7. Press ▶ EDIT to access the Single Date Open/Close screen.

8. Press ▶ OPEN and then press ▲ or ▼ to enter the desired store opening time.

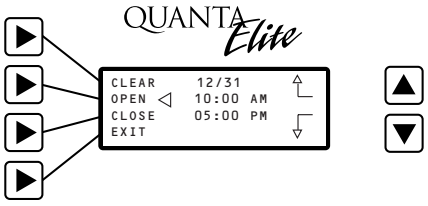
9. Press ▶ CLOSE and then press ▲ or ▼ to enter the desired closing time.

10. Press ▶ EXIT to view the Special Date Open and Close Times.

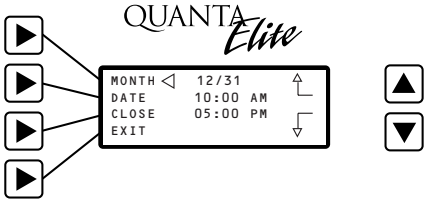
11. Let the controller time out and save the entries.



Steps 5 and 6



Steps 8 and 9



Step 10

E.5.2 Define the Timers

1. From the Home screen, press ▶ EDIT; then press ▼ 3 times.

2. Press ▶ TIMERS to access the top level Timer Definition screen.

3. Press ▲ until the Timer you wish to program to the store opening times appears (in this example, TIMER: 02).

4. Press ▶ TIME; then press ▲ OPEN/CLOSE.

5. Press ▶ OPEN; then ▼ until OPN-15 MN appears. This sets the timer to turn lights ON 15 minutes before the opening time.

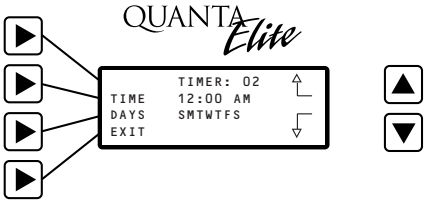
6. Press ▶ EXIT to return to the top level Timer screen.

7. Press ▲ until the timer you wish to key to the store close time appears (in this example, TIMER: 03).

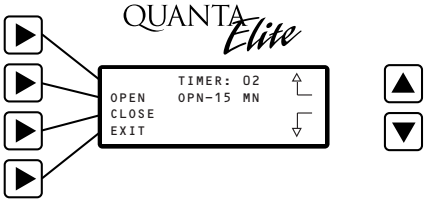
8. Press ▶ TIME; then press ▶ OPEN/CLOSE.

9. Press ▶ Close; then ▼ until CLS+15 MN appears. This sets the timer to turn lights OFF 15 minutes after the closing time.

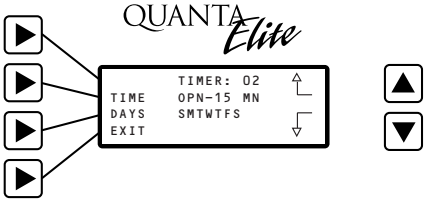
10. Let the controller time out and save the entries.



Top Level Timer Definition Screen (Step 2)



Time Setting Screen



Top Level Timer Definition Screen (after Step 6)

E.5.3 Map the Lighting Relays to the Timers

1. From the Home screen, press ▶ EDIT; then press ▼ 4 times.

2. Press ▶ TIMER/RELAY CONTROL to access the top level Control Definition screen.

3. Press ▶ TIMER until 02 appears.

4. If necessary, press and **HOLD** ▶ RELAY; then press ▲ until the node (controller) containing the relays to be controlled appears. Then press ▶ O.K. to return to the top level Control Definition screen.

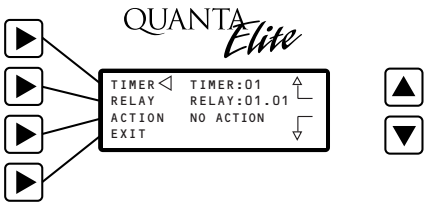
5. Press ▶ RELAY; then ▲ until the first relay to be controlled appears.

6. Press ▶ ACTION; then ▲ until TURN ON appears.

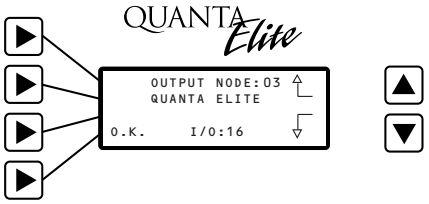
7. Repeat steps 4 to 6 as required until you have defined all the relays in each node turned on by TIMER: 02.

8. Press ▶ TIMER until TIMER: 03 appears.

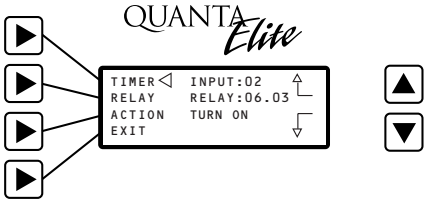
9. Repeat steps 4 to 7 except that you select TURN OFF for the relay action.



Top Level Timer/Relay Control Definition Screen (Before)



Node Selection Screen



Top Level Screen (After Step 6)

M.1 Overview

MODBUS protocol is an industrial communications and distributive control system developed by Gould-Modicon to integrate programmable logic controllers (PLCs), computers, terminals and other monitoring, sensing, and control devices. By setting the protocol jumpers on the Quanta Lighting Controller QSLI plug in LAN Module, and setting a unique address via the address DIP switches, a Quanta Elite lighting controller can become a Slave NODE on the MODBUS Network. (See Figure M-1.)

M.2 Structure

MODBUS is a Master/Slave communications protocol. One device (the Master) controls all serial activity by selectively polling one or more of the slave devices. The maximum number of slave devices is 247 per network. Each device (node) is assigned a unique address to distinguish it from all the other nodes.

Only the Master initiates a transaction. Transactions are either a query/response (only a single slave is addressed), or a broadcast/no response (all slaves are addressed). A transaction comprises a single query and single response frame or a single broadcast frame.

Certain characteristics of the MODBUS protocol are fixed: frame format, frame sequences, communications error handling, exception conditions, and the functions performed.

Other characteristics are selectable: transmission media, baud rate, character parity, number of stop bits, communications error handling, exception conditions, and functions performed.

M.3 Transmission Modes

The transmission mode is the structure of the individual units of information within a message, and the numbering system used to transmit the data. Two transmission modes are available. Both provide the same communication capabilities. The mode slected depends on the equipment used as the MODBUS master. Only one transmission mode may be selected per network. Mixing modes on a single network is not allowed. The two available tranbsmission modes are ASCII (American Standard Code For Information Interchange) and RTU (Remote Terminal Unit)

M.3.1 ASCII

Coding System – ASCII (7 Bit); hexadecimal uses ASCII printable characters (0-9, A-F)

Start Bits – 1

Data Bits (least significant first) – 7

Parity (optional) – 1 (1 Bit set for even or odd, no Bits for no parity)

Stop Bits – 1 or 2

Error Checking – LRC (Longitudinal Redundancy Check)

M.3.2 RTU

Coding System – 8 Bit Binary

Start Bits – 1

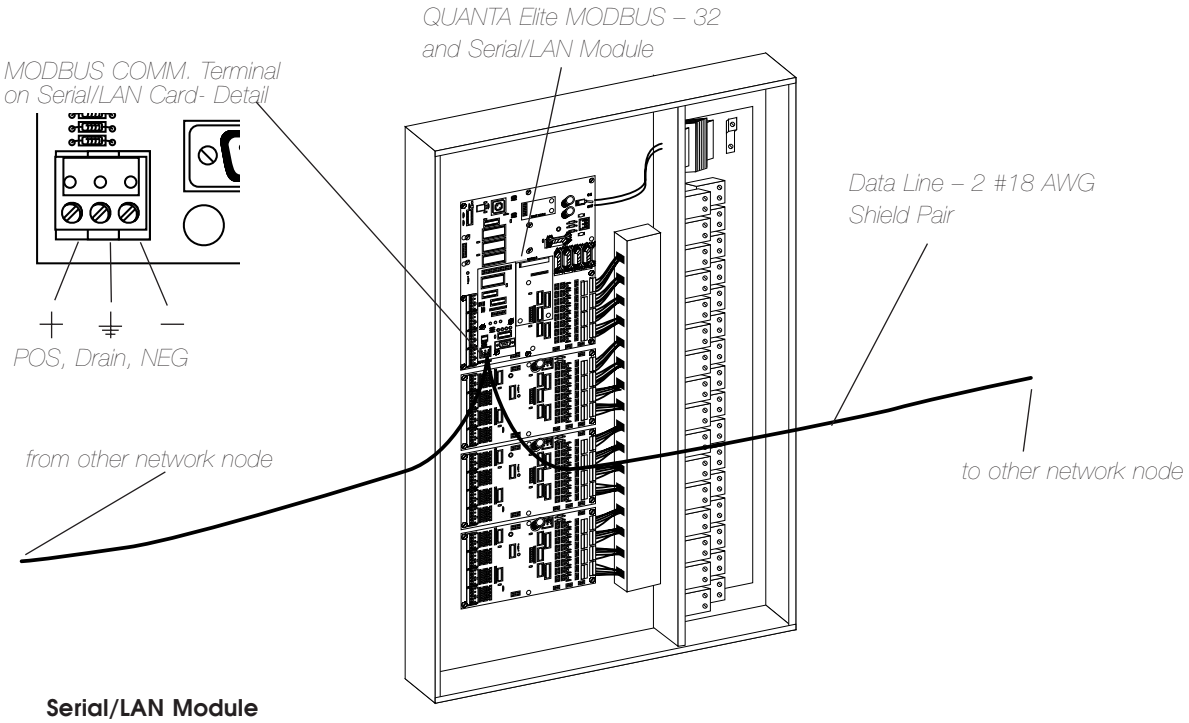
Data Bits (least significant first) – 8

Parity (optional) – 1 (1 Bit set for even or odd, no Bits for no parity)

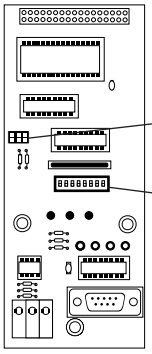
Stop Bits – 1 or 2

Error Checking – CRC (Cyclical Redundancy Check)

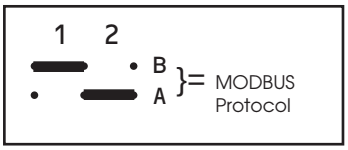
QUANTA MODBUS Communications Example – See Termination Detail Below



Serial/LAN Module

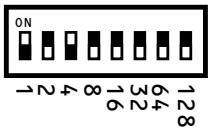


Protocol jumper configuration



WARNING:
Processor must be turned OFF before protocol jumper changes.

DIP Switch Addressing



Add the value of each ON switch to determine the address (address 5 shown).

Termination Detail – connections to Serial/LAN card with RS485 Data Cable

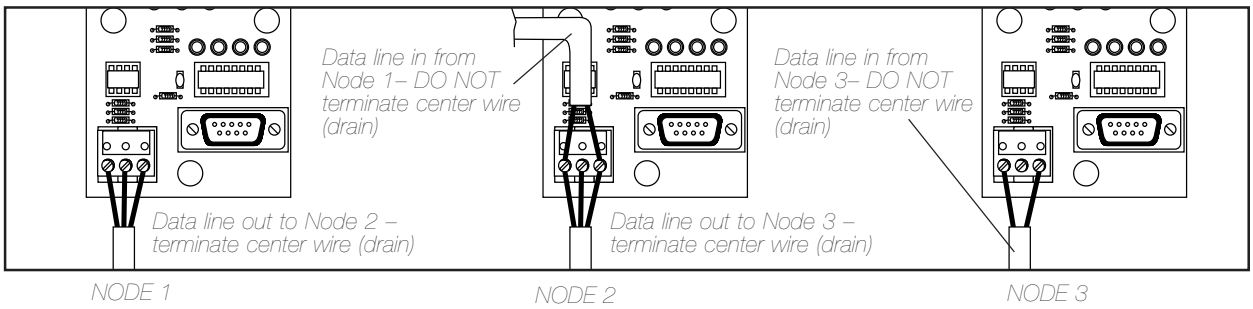

Data line in from Node 1– DO NOT terminate center wire (drain)
Data line in from Node 3– DO NOT terminate center wire (drain)
Data line out to Node 2 – terminate center wire (drain)
Data line out to Node 3 – terminate center wire (drain)
NODE 1
NODE 2
NODE 3

Figure M-1: MODBUS Set-Up

M.4 Transmission Mode Characteristics

ASCII printable characters are easy to view when trouble shooting and this mode is suited to PLC masters and computer masters programmed in a high level language, such as VISCOM BASIC.

In RTU mode, data is sent in 8-bit binary characters. In ASCII mode, data is divided into two 4 bit parts and then represented by the hexadecimal equivalent. ASCII mode uses twice as many characters as RTU mode but decoding is easier.

In RTU mode data must be transmitted in a continuous stream. In ASCII mode breaks of up to one second can occur between characters to allow for a relatively slow master.

M.5 Hardware Setup

The Quanta Elite must be equipped with a QSLI LAN module that is jumpered for MODBUS communications and addressed with a unique node address. (See Figure M-1.) The network cable is a two wire shielded twisted pair. Consult the Automation system provider for the exact specifications. Terminate the cable as shown in Figure M.1.

M.6 Required Parameter Entries

After setting the Quanta Controller jumpers and address DIP switches, you must power up the Quanta controller and define certain operational parameters for MODBUS communication. (See Figure M.2)

M.7 Framing

Both ASCII and RTU transmission modes feature mechanisms to indicate the beginning and end of a frame, the node address, a function code (the type of information sought/command signal), a data field indicating the particular point or register accessed. See Table M-1 for data field I/O point designators for a Quanta Controller node.

M.8 Supported Commands

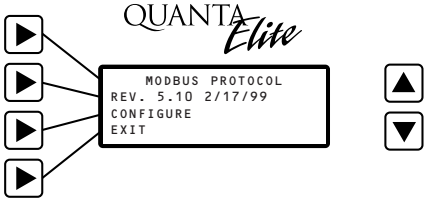
01 Read coil status
02 Read Input status
05 Force single coil
15 Force multiple coils

M.9 Additional Information

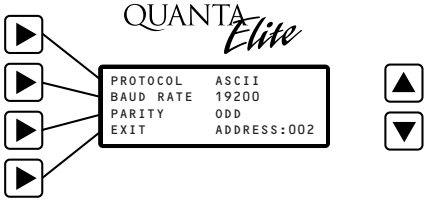
Contact Modicon Inc. if you would like more detailed information on MODBUS protocol or refer to Modcon Modbus Protocol Reference Guide.

Procedure

1. Access the top level MODBUS Screen
2. Press ▶ **CONFIGURE**.
3. When the Configuration screen Appears, press ▶ **PROTOCOL** until the desired transmission mode appears.
4. Press ▶ **BAUD RATE** until the desired baud rate appeared.
5. Press ▶ **PARITY** until the desired parity appears.
6. Press ▶ **EXIT** or let the controller time out to save the entries.



MODBUS Top Level Screen



MODBUS Top Configuration Screen

Figure M-2

Quanta Input	ON	OFF	Closed	Open
1	1	49	1 = Input Closed	0= Input Open
2	2	50	1 = Input Closed	0= Input Open
3	3	51	1 = Input Closed	0= Input Open
4	4	52	1 = Input Closed	0= Input Open
5	5	53	1 = Input Closed	0= Input Open
6	6	54	1 = Input Closed	0= Input Open
7	7	55	1 = Input Closed	0= Input Open
8	8	56	1 = Input Closed	0= Input Open
9	9	57	1 = Input Closed	0= Input Open
10	10	58	1 = Input Closed	0= Input Open
11	11	59	1 = Input Closed	0= Input Open
12	12	60	1 = Input Closed	0= Input Open
13	13	61	1 = Input Closed	0= Input Open
14	14	62	1 = Input Closed	0= Input Open
15	15	63	1 = Input Closed	0= Input Open
16	16	64	1 = Input Closed	0= Input Open
17	17	65	1 = Input Closed	0= Input Open
18	18	66	1 = Input Closed	0= Input Open
19	19	67	1 = Input Closed	0= Input Open
20	20	68	1 = Input Closed	0= Input Open
21	21	69	1 = Input Closed	0= Input Open
22	22	70	1 = Input Closed	0= Input Open
23	23	71	1 = Input Closed	0= Input Open
24	24	72	1 = Input Closed	0= Input Open
25	25	73	1 = Input Closed	0= Input Open
26	26	74	1 = Input Closed	0= Input Open
27	27	75	1 = Input Closed	0= Input Open
28	28	76	1 = Input Closed	0= Input Open
29	29	77	1 = Input Closed	0= Input Open
30	30	78	1 = Input Closed	0= Input Open
31	31	79	1 = Input Closed	0= Input Open
32	32	80	1 = Input Closed	0= Input Open
33	33	81	1 = Input Closed	0= Input Open
34	34	82	1 = Input Closed	0= Input Open
35	35	83	1 = Input Closed	0= Input Open
36	36	84	1 = Input Closed	0= Input Open
37	37	85	1 = Input Closed	0= Input Open
38	38	86	1 = Input Closed	0= Input Open
39	39	87	1 = Input Closed	0= Input Open
40	40	88	1 = Input Closed	0= Input Open
41	41	89	1 = Input Closed	0= Input Open
42	42	90	1 = Input Closed	0= Input Open
43	43	91	1 = Input Closed	0= Input Open
44	44	92	1 = Input Closed	0= Input Open
45	45	93	1 = Input Closed	0= Input Open
46	46	94	1 = Input Closed	0= Input Open
47	47	95	1 = Input Closed	0= Input Open
48	48	96	1 = Input Closed	0= Input Open

Table M.1 – Quanta Elite Data Field Input Point Designators

Quanta Output	Closed	Open
1	1=Output Closed	0=Output Open
2	1=Output Closed	0=Output Open
3	1=Output Closed	0=Output Open
4	1=Output Closed	0=Output Open
5	1=Output Closed	0=Output Open
6	1=Output Closed	0=Output Open
7	1=Output Closed	0=Output Open
8	1=Output Closed	0=Output Open
9	1=Output Closed	0=Output Open
10	1=Output Closed	0=Output Open
11	1=Output Closed	0=Output Open
12	1=Output Closed	0=Output Open
13	1=Output Closed	0=Output Open
14	1=Output Closed	0=Output Open
15	1=Output Closed	0=Output Open
16	1=Output Closed	0=Output Open
17	1=Output Closed	0=Output Open
18	1=Output Closed	0=Output Open
19	1=Output Closed	0=Output Open
20	1=Output Closed	0=Output Open
21	1=Output Closed	0=Output Open
22	1=Output Closed	0=Output Open
23	1=Output Closed	0=Output Open
24	1=Output Closed	0=Output Open
25	1=Output Closed	0=Output Open
26	1=Output Closed	0=Output Open
27	1=Output Closed	0=Output Open
28	1=Output Closed	0=Output Open
29	1=Output Closed	0=Output Open
30	1=Output Closed	0=Output Open
31	1=Output Closed	0=Output Open
32	1=Output Closed	0=Output Open
33	1=Output Closed	0=Output Open
34	1=Output Closed	0=Output Open
35	1=Output Closed	0=Output Open
36	1=Output Closed	0=Output Open
37	1=Output Closed	0=Output Open
38	1=Output Closed	0=Output Open
39	1=Output Closed	0=Output Open
40	1=Output Closed	0=Output Open
41	1=Output Closed	0=Output Open
42	1=Output Closed	0=Output Open
43	1=Output Closed	0=Output Open
44	1=Output Closed	0=Output Open
45	1=Output Closed	0=Output Open
46	1=Output Closed	0=Output Open
47	1=Output Closed	0=Output Open
48	1=Output Closed	0=Output Open

Table M.1.1 – Quanta Elite Data Field Output Point Designators

N.1 Overview

The Quanta Elite Controller(s) can be integrated into a Building Automation System (BAS) that uses the N2 communications protocol. The host system can then pole the status of the Quanta Elite Controller inputs and outputs and issue ON/OFF commands to the Elite's relay outputs.

If the N2 network is not running, all local control features supported by the individual controller nodes will continue to operate.

N.2 Hardware Setup

The Quanta Elite must be equipped with a serial LAN module that is jumpered for N2 communications and addressed with a unique node address. (See Figure N-1.) The network cable is a two wire shielded twisted pair. Consult the BAS system documentation for the exact specifications. Terminate the cable as shown in Figure N-1.

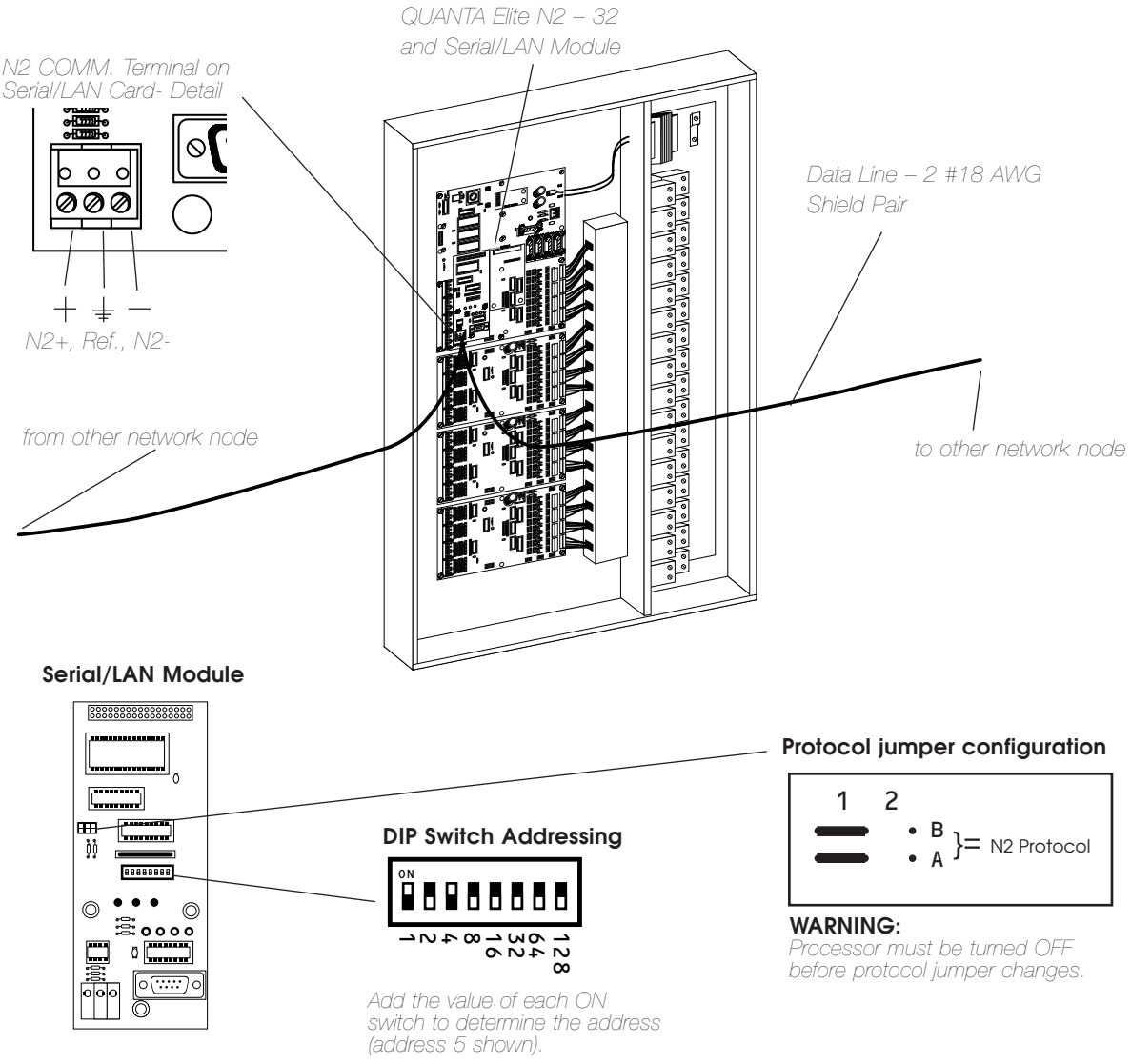
N.3 Point Map

Fill out the point map for the Quanta Elite Controller. Note that only BI (binary input) and BO (binary output) point types are used. **When writing to a BO point the normal state is always OFF.** The completed point map will serve as the control schedule used to determine how Quanta Elite relay outputs will be controlled.

N.4 Unsupported Attributes

Se Table N-2 for a list of unsupported attributes.

QUANTA Elite N2 Network Example – See Termination Detail Below


QUANTA Elite N2 – 32 and Serial/LAN Module
N2 COMM. Terminal on Serial/LAN Card- Detail
N2+, Ref., N2-
Data Line – 2 #18 AWG Shield Pair
from other network node
to other network node
Serial/LAN Module
Protocol jumper configuration
1 2
B
A
}= N2 Protocol
DIP Switch Addressing
ON
1 2 4 8 16 32 64 128
WARNING:
Processor must be turned OFF before protocol jumper changes.
Add the value of each ON switch to determine the address (address 5 shown).

Termination Detail – connections to Serial/LAN card with RS485 Data Cable

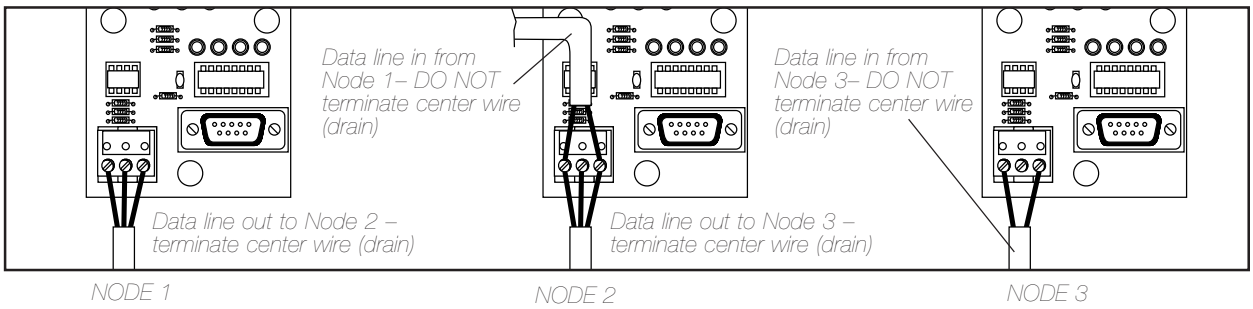

Data line in from Node 1– DO NOT terminate center wire (drain)
Data line in from Node 3– DO NOT terminate center wire (drain)
Data line out to Node 2 – terminate center wire (drain)
Data line out to Node 3 – terminate center wire (drain)
NODE 1
NODE 2
NODE 3

Figure N-1 N2 Set-Up

NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE	NOTES
BI	1		SWITCH INPUT #1 OFF	0-OPEN 1-CLOSED	
BI	2		SWITCH INPUT #1 ON	0-OPEN 1-CLOSED	
BI	3		SWITCH INPUT #2 OFF	0-OPEN 1-CLOSED	
BI	4		SWITCH INPUT #2 ON	0-OPEN 1-CLOSED	
BI	5		SWITCH INPUT #3 OFF	0-OPEN 1-CLOSED	
BI	6		SWITCH INPUT #3 ON	0-OPEN 1-CLOSED	
BI	7		SWITCH INPUT #4 OFF	0-OPEN 1-CLOSED	
BI	8		SWITCH INPUT #4 ON	0-OPEN 1-CLOSED	
BI	9		SWITCH INPUT #5 OFF	0-OPEN 1-CLOSED	
BI	10		SWITCH INPUT #5 ON	0-OPEN 1-CLOSED	
BI	11		SWITCH INPUT #6 OFF	0-OPEN 1-CLOSED	
BI	12		SWITCH INPUT #6 ON	0-OPEN 1-CLOSED	
BI	13		SWITCH INPUT #7 OFF	0-OPEN 1-CLOSED	
BI	14		SWITCH INPUT #7 ON	0-OPEN 1-CLOSED	
BI	15		SWITCH INPUT #8 OFF	0-OPEN 1-CLOSED	
BI	16		SWITCH INPUT #8 ON	0-OPEN 1-CLOSED	
BI	17		SWITCH INPUT #9 OFF	0-OPEN 1-CLOSED	
BI	18		SWITCH INPUT #9 ON	0-OPEN 1-CLOSED	
BI	19		SWITCH INPUT #10 OFF	0-OPEN 1-CLOSED	
BI	20		SWITCH INPUT #10 ON	0-OPEN 1-CLOSED	
BI	21		SWITCH INPUT #11 OFF	0-OPEN 1-CLOSED	
BI	22		SWITCH INPUT #11 ON	0-OPEN 1-CLOSED	
BI	23		SWITCH INPUT #12 OFF	0-OPEN 1-CLOSED	
BI	24		SWITCH INPUT #12 ON	0-OPEN 1-CLOSED	

Table N.1 – Quanta Elite N2 Point Map

NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE	NOTES
BI	25		SWITCH INPUT #13 OFF	0-OPEN 1-CLOSED	
BI	26		SWITCH INPUT #13 ON	0-OPEN 1-CLOSED	
BI	27		SWITCH INPUT #14 OFF	0-OPEN 1-CLOSED	
BI	28		SWITCH INPUT #14 ON	0-OPEN 1-CLOSED	
BI	29		SWITCH INPUT #15 OFF	0-OPEN 1-CLOSED	
BI	30		SWITCH INPUT #15 ON	0-OPEN 1-CLOSED	
BI	31		SWITCH INPUT #16 OFF	0-OPEN 1-CLOSED	
BI	32		SWITCH INPUT #16 ON	0-OPEN 1-CLOSED	
BI	33		SWITCH INPUT #17 OFF	0-OPEN 1-CLOSED	
BI	34		SWITCH INPUT #17 ON	0-OPEN 1-CLOSED	
BI	35		SWITCH INPUT #18 OFF	0-OPEN 1-CLOSED	
BI	36		SWITCH INPUT #18 ON	0-OPEN 1-CLOSED	
BI	37		SWITCH INPUT #19 OFF	0-OPEN 1-CLOSED	
BI	38		SWITCH INPUT #19 ON	0-OPEN 1-CLOSED	
BI	39		SWITCH INPUT #20 OFF	0-OPEN 1-CLOSED	
BI	40		SWITCH INPUT #20 ON	0-OPEN 1-CLOSED	
BI	41		SWITCH INPUT #21 OFF	0-OPEN 1-CLOSED	
BI	42		SWITCH INPUT #21 ON	0-OPEN 1-CLOSED	
BI	43		SWITCH INPUT #22 OFF	0-OPEN 1-CLOSED	
BI	44		SWITCH INPUT #22 ON	0-OPEN 1-CLOSED	
BI	45		SWITCH INPUT #23 OFF	0-OPEN 1-CLOSED	
BI	46		SWITCH INPUT #23 ON	0-OPEN 1-CLOSED	
BI	47		SWITCH INPUT #24 OFF	0-OPEN 1-CLOSED	
BI	48		SWITCH INPUT #24 ON	0-OPEN 1-CLOSED	
BI	49		SWITCH INPUT #25 OFF	0-OPEN 1-CLOSED	

Table N.1 – Quanta Elite N2 Point Map

NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE	NOTES
BI	50		SWITCH INPUT #25 ON	0-OPEN 1-CLOSED	
BI	51		SWITCH INPUT #26 OFF	0-OPEN 1-CLOSED	
BI	52		SWITCH INPUT #26 ON	0-OPEN 1-CLOSED	
BI	53		SWITCH INPUT #27 OFF	0-OPEN 1-CLOSED	
BI	54		SWITCH INPUT #27 ON	0-OPEN 1-CLOSED	
BI	55		SWITCH INPUT #28 OFF	0-OPEN 1-CLOSED	
BI	56		SWITCH INPUT #28 ON	0-OPEN 1-CLOSED	
BI	57		SWITCH INPUT #29 OFF	0-OPEN 1-CLOSED	
BI	58		SWITCH INPUT #29 ON	0-OPEN 1-CLOSED	
BI	59		SWITCH INPUT #30 OFF	0-OPEN 1-CLOSED	
BI	60		SWITCH INPUT #30 ON	0-OPEN 1-CLOSED	
BI	61		SWITCH INPUT #31 OFF	0-OPEN 1-CLOSED	
BI	62		SWITCH INPUT #31 ON	0-OPEN 1-CLOSED	
BI	63		SWITCH INPUT #32 OFF	0-OPEN 1-CLOSED	
BI	64		SWITCH INPUT #32 ON	0-OPEN 1-CLOSED	
BI	65		SWITCH INPUT #33 OFF	0-OPEN 1-CLOSED	
BI	66		SWITCH INPUT #33 ON	0-OPEN 1-CLOSED	
BI	67		SWITCH INPUT #34 OFF	0-OPEN 1-CLOSED	
BI	68		SWITCH INPUT #34 ON	0-OPEN 1-CLOSED	
BI	69		SWITCH INPUT #35 OFF	0-OPEN 1-CLOSED	
BI	70		SWITCH INPUT #35 ON	0-OPEN 1-CLOSED	
BI	71		SWITCH INPUT #36 OFF	0-OPEN 1-CLOSED	
BI	72		SWITCH INPUT #36 ON	0-OPEN 1-CLOSED	
BI	73		SWITCH INPUT #37 OFF	0-OPEN 1-CLOSED	

Table N.1 – Quanta Elite N2 Point Map

NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE	NOTES
BI	74		SWITCH INPUT #37 ON	0-OPEN 1-CLOSED	
BI	75		SWITCH INPUT #38 OFF	0-OPEN 1-CLOSED	
BI	76		SWITCH INPUT #38 ON	0-OPEN 1-CLOSED	
BI	77		SWITCH INPUT #39 OFF	0-OPEN 1-CLOSED	
BI	78		SWITCH INPUT #39 ON	0-OPEN 1-CLOSED	
BI	79		SWITCH INPUT #40 OFF	0-OPEN 1-CLOSED	
BI	80		SWITCH INPUT #40 ON	0-OPEN 1-CLOSED	
BI	81		SWITCH INPUT #41 OFF	0-OPEN 1-CLOSED	
BI	82		SWITCH INPUT #41 ON	0-OPEN 1-CLOSED	
BI	83		SWITCH INPUT #42 OFF	0-OPEN 1-CLOSED	
BI	84		SWITCH INPUT #42 ON	0-OPEN 1-CLOSED	
BI	85		SWITCH INPUT #43 OFF	0-OPEN 1-CLOSED	
BI	86		SWITCH INPUT #43 ON	0-OPEN 1-CLOSED	
BI	87		SWITCH INPUT #44 OFF	0-OPEN 1-CLOSED	
BI	88		SWITCH INPUT #44 ON	0-OPEN 1-CLOSED	
BI	89		SWITCH INPUT #45 OFF	0-OPEN 1-CLOSED	
BI	90		SWITCH INPUT #45 ON	0-OPEN 1-CLOSED	
BI	91		SWITCH INPUT #46 OFF	0-OPEN 1-CLOSED	
BI	92		SWITCH INPUT #46 ON	0-OPEN 1-CLOSED	
BI	93		SWITCH INPUT #47 OFF	0-OPEN 1-CLOSED	
BI	94		SWITCH INPUT #47 ON	0-OPEN 1-CLOSED	
BI	95		SWITCH INPUT #48 OFF	0-OPEN 1-CLOSED	
BI	96		SWITCH INPUT #48 ON	0-OPEN 1-CLOSED	

Table N.1 – Quanta Elite N2 Point Map

NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE	NOTES
BO	1		RELAY OUTPUT #1	0-OFF 1-ON	
BO	2		RELAY OUTPUT #2	0-OFF 1-ON	
BO	3		RELAY OUTPUT #3	0-OFF 1-ON	
BO	4		RELAY OUTPUT #4	0-OFF 1-ON	
BO	5		RELAY OUTPUT #5	0-OFF 1-ON	
BO	6		RELAY OUTPUT #6	0-OFF 1-ON	
BO	7		RELAY OUTPUT #7	0-OFF 1-ON	
BO	8		RELAY OUTPUT #8	0-OFF 1-ON	
BO	9		RELAY OUTPUT #9	0-OFF 1-ON	
BO	10		RELAY OUTPUT #10	0-OFF 1-ON	
BO	11		RELAY OUTPUT #11	0-OFF 1-ON	
BO	12		RELAY OUTPUT #12	0-OFF 1-ON	
BO	13		RELAY OUTPUT #13	0-OFF 1-ON	
BO	14		RELAY OUTPUT #14	0-OFF 1-ON	
BO	15		RELAY OUTPUT #15	0-OFF 1-ON	
BO	16		RELAY OUTPUT #16	0-OFF 1-ON	
BO	17		RELAY OUTPUT #17	0-OFF 1-ON	
BO	18		RELAY OUTPUT #18	0-OFF 1-ON	
BO	19		RELAY OUTPUT #19	0-OFF 1-ON	
BO	20		RELAY OUTPUT #20	0-OFF 1-ON	
BO	21		RELAY OUTPUT #21	0-OFF 1-ON	
BO	22		RELAY OUTPUT #22	0-OFF 1-ON	
BO	23		RELAY OUTPUT #23	0-OFF 1-ON	
BO	24		RELAY OUTPUT #24	0-OFF 1-ON	

Table N.1 – Quanta Elite N2 Point Map

NETWORK POINT TYPE	NETWORK POINT ADDRESS	UNITS	POINT DESCRIPTION	RANGE/VALUE	NOTES
BO	25		RELAY OUTPUT #25	0-OFF 1-ON	
BO	26		RELAY OUTPUT #26	0-OFF 1-ON	
BO	27		RELAY OUTPUT #27	0-OFF 1-ON	
BO	28		RELAY OUTPUT #28	0-OFF 1-ON	
BO	29		RELAY OUTPUT #29	0-OFF 1-ON	
BO	30		RELAY OUTPUT #30	0-OFF 1-ON	
BO	31		RELAY OUTPUT #31	0-OFF 1-ON	
BO	32		RELAY OUTPUT #32	0-OFF 1-ON	
BO	33		RELAY OUTPUT #33	0-OFF 1-ON	
BO	34		RELAY OUTPUT #34	0-OFF 1-ON	
BO	35		RELAY OUTPUT #35	0-OFF 1-ON	
BO	36		RELAY OUTPUT #36	0-OFF 1-ON	
BO	37		RELAY OUTPUT #37	0-OFF 1-ON	
BO	38		RELAY OUTPUT #38	0-OFF 1-ON	
BO	39		RELAY OUTPUT #39	0-OFF 1-ON	
BO	40		RELAY OUTPUT #40	0-OFF 1-ON	
BO	41		RELAY OUTPUT #41	0-OFF 1-ON	
BO	42		RELAY OUTPUT #42	0-OFF 1-ON	
BO	43		RELAY OUTPUT #43	0-OFF 1-ON	
BO	44		RELAY OUTPUT #44	0-OFF 1-ON	
BO	45		RELAY OUTPUT #45	0-OFF 1-ON	
BO	46		RELAY OUTPUT #46	0-OFF 1-ON	
BO	47		RELAY OUTPUT #47	0-OFF 1-ON	
BO	48		RELAY OUTPUT #48	0-OFF 1-ON	

Table N.1 – Quanta Elite N2 Point Map

Attribute Region	Attribute	Bit #	Comments
Analog Inputs			Not supported
Analog outputs			Not supported
Internal Float			Not supported
Internal Integer			Not supported
Internal Byte			Not supported
Binary Input	1	0	COS_enabled Always 0 (COS is always 0)
Binary Input	1	1	Normal State Always Open=0 closed=1
Binary Input	1	3	Alarm_enabled Always 0 (disabled)
Binary Input	2	0	Always reliable (0)
Binary Input	2	1	Override Active Always 0 (not active)
Binary Input	2	4	Normal (0)
Binary Input	2	5	JCI use only
Binary Input	3		JCI use only
Binary Input	4		JCI use only
Binary Output	1	0	COS_enabled Always (COS is always enabled)
Binary Output	1	1	Normal State (Always 0)
Binary Output	2	0	Always reliable (0)
Binary Output	2	1	Override active Always 0 (not active)
Binary Output	2	4	JCI use only
Binary Output	2	5	JCI use only
Binary Output	3		Minimum ON time Always 0
Binary Output	4		Minimum OFF time Always 0
Binary Output	5		Maximum Cycles/Hour Always 0
Binary Output	6		JCI use only
Binary Output	7		JCI use only

BLDG DISTRIBUTION DIAGRAMS 10

This section is dedicated to each and every system that has a Building Distribution Schematic Diagram and wishes it to be included in the manual. It is here to assist the engineer, route mechanic or facility personnel to see the “big picture” of all related systems and parts.